ORGANIZING THE INFORMATION CENTER

INPUT

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U-1983
OIC
AUTHOR
TITLE
BORROWER'S NAME
U-1983
OIC

OFFICES

Headquarters
1943 Landings Drive
Mountain View, CA 9404
(415) 960-3990
Telex 171407

Detroit
220 E. Huron
Suite 209
Ann Arbor, MI 48104
(313) 971-0667

New York
Park 80 Plaza West-1
Saddle Brook, NJ 07662
(201) 368-9471
Telex 134630

United Kingdom
INPUT, Ltd.
Airwork House
35 Piccadilly
London, W1V 9PB
England
01-439-8985
Telex 23116

Japan
Overseas Data Service Company, Ltd.
Shugetsu Building
No 12 - 7 Kita Aoyama
3-Chome Minato-ku
Tokyo, 107
Japan
(03) 400-7090
Telex 26487

Sweden
Athena Konsult
P.O. Persson & Co AB
Box 22114
S-104 22 Stockholm
Sweden
08-52 07 20
Telex 17041

INPUT Planning Services for Management

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ORGANIZING THE INFORMATION CENTER

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1 INTRODUCTION

I INTRODUCTION

A. REASONS FOR PREPARING THIS REPORT

- Information center (IC) development received one of the highest expressions of interest at INPUT's 1982 Client Conference. The reasons for this are:
  - General awareness of the potential of the IC.
  - Failure of many ICs to fulfill their promise.
  - Questions concerning how the IC will be affected by personal computers.
- Many large-scale information systems (IS) operations have an "information center," as seen in Exhibit I-1.
  - Often these operations are not perceived by users as offering the right mix of products and services.
  - IS management is aware that their IC could become much more effective.
- INPUT believes that the IC will become a cornerstone in the information strategy for the remainder of the 1980s.

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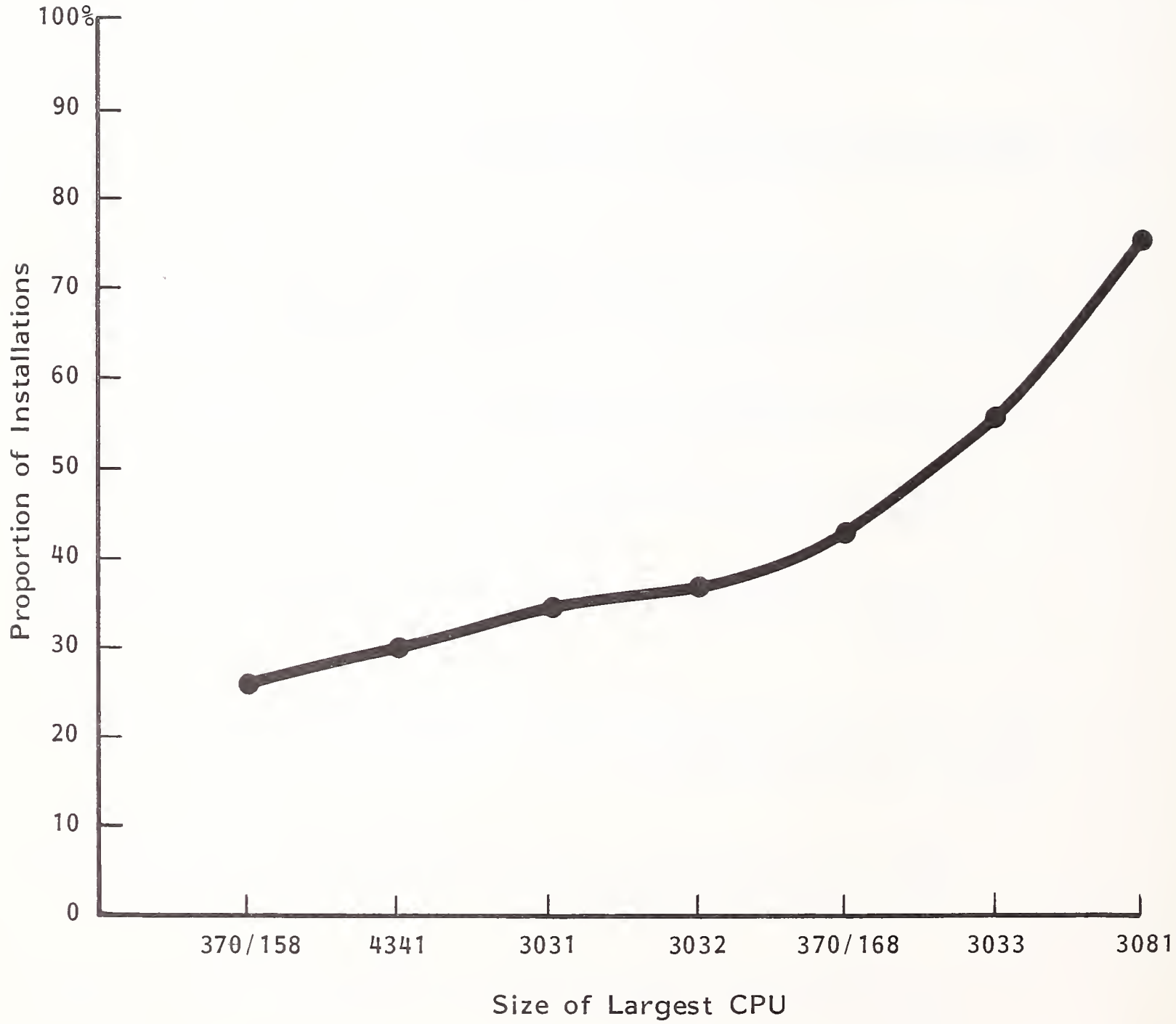
EXHIBIT I-1

INSTALLATION WITH AN INFORMATION CENTER,
BY CPU SIZE



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- This report will assist IS management in:

  - Helping to plan a new or enhanced IC.

  - Checking the functions to be contained in an existing or planned IC.

  - Dealing with the positive and negative aspects of IC growth.

B. SCOPE AND METHODOLOGY

- This report addresses the following issues:

  - Launching the information center (Chapter III):

    . Primary functions included.

    . Implementing the IC.

  - The competitive position of the information center (Chapter IV):

    . IC benefits.

    . Risks and how to deal with them.

    . Current and future competitive solutions.

  - Strategic issues (Chapter V):

    . The implication of growth and how to guide it.

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. The future directions of ICs, including stages of IC development.

- The information for this report was gathered from the following sources:

  - Thirty-eight interviews with personnel from a variety of companies using or planning to use ICs. These included both user and IC managers. The questionnaire is in Appendix A.

  - Over a dozen in-depth discussions with timesharing IC operators at leading industrial companies and commercial remote computing services (RCS) firms.

  - INPUT's studies about and for the commercial RCS industry.

  - INPUT's knowledge of practices and issues in the commercial RCS industry.

- INPUT has taken the best practices in existing and planned ICs as well as commercial RCS to serve as the basis for the analysis and recommendations in this report.

C. OTHER RELATED INPUT REPORTS

- Readers of this report may wish to review other INPUT reports:

  - Personal Computers and the IS Strategy, December 1982.

    . This report recommends the most effective ways for IS to become involved with personal computers (PCs).

  - Supporting Personal Computer Software, June 1983.

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  - Some PC user interface issues are similar to those for IC users. This report suggests the approach of IS-supplied consulting to identify user computing alternatives.

- In addition, the upcoming report on fourth generation languages is very important, since fourth generation languages are a key component of the IC. Key issues are:

  - Can fourth generation languages help make the centralized mainframe competitive with the PC?

  - What impact will fourth generation languages have on conventional data processing?

D. DEFINITIONS

- There is not a commonly accepted definition of an IC.

  - The concept is hardware independent. However, IBM has popularized the term since its origination by IBM Canada in 1979.

  - IBM has a number of software products which, taken together, constitute the foundation of the IC.

  - However, software products of independent software vendors are at least as valuable as IBM's offerings and, taken together, are much more comprehensive.

- This report suggests the following short definition of an IC: "enhanced in-house timesharing" for end users.

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- This implies that most in-house timesharing does not meet the requirements that could be reasonably expected of it.

- Many in-house timesharing operations are, in their unchanged form, poor foundations upon which to build an IC.

- While programmers do use many so-called ICs, this is usually only a retitling of historic timesharing options (TSO) facilities.

  - Programmer needs are generally quite different from end-user needs.

  - This is recognized by some installations, which call their programmer-oriented facilities "resource centers."

- An IC needs:

  - Adequate hardware resources.

  - An integrated set of software tools, i.e., a "software portfolio."

  - A rich support environment, including:

    . Training.

    . Hotline support.

    . Consulting.

  - A business or marketing plan.

- The information center can be a place that contains hardware on-site support staff and reference material. It also can be a "virtual center," not a physical computer location.

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- Adequate support and planning are most often missing from current efforts. Therefore, even (or, sometimes, especially) those IS departments with current ICs or in-house timesharing should compare their efforts with the models described in this report.

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II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

- Note: this executive summary is designed in a presentation format in order to:

  - Help the busy reader quickly review key research findings.

  - Provide a ready-to-go executive presentation, complete with a script, to facilitate group communication.

- The key points of the entire report are summarized in Exhibits II-1 through II-8. On the right-hand page facing each exhibit is a script explaining its contents.

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A. INFORMATION CENTER: CORNERSTONE OF INFORMATION STRATEGY IN THE 1980s

- The Information Center (IC) can be thought of as "enhanced in-house timesharing." The enhancement treats the IC as its own business. This requires that the IC provide the services demanded by its customers, end users, as seen in Exhibit II-1. The most glaring weaknesses of most ICs are inadequate support and poor, if any, business plans. Without proper support and planning, the IC will be relegated to the role of in-house timesharing, and its "customers" will choose other alternatives.

- This report is part of INPUT's Information Systems Program (ISP). The report:

  - Describes the issues to be considered when establishing an IC.

  - Identifies the risks and benefits of the IC.

  - Provides recommendations for managing the growth of the IC.

  - Describes the future direction of ICs, including stages of IC development.

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EXHIBIT II-1

INFORMATION CENTER:
CORNERSTONE OF INFORMATION STRATEGY

- IC is more than in-house timesharing
  - Organizational Entry
  - Rich Support Environment
  - Run as Its Own Business
- Report Scope
  - Establishing an IC
  - IC Risks and Benefits
  - Managing IC Growth
  - Planning for the Future Directions of IC

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B. REQUIREMENTS FOR A SUCCESSFUL IC

- The concept of a balanced software portfolio is critical for IC success, as seen in Exhibit II-2. Too large a variety of software packages will result in a confusing overlap of packages and options. Too small a variety will not satisfy the user's needs.

- The software portfolio should contain packages from the following groups:

  - Programmer support.

  - Application specific.

  - Fourth generation language.

  - Personal computing.

- It is user interface that differentiates the IC from other IS services. Empathy with the user is mandatory, user training is essential, and consulting assistance to identify and implement solutions is also required. Marshalling the appropriate support staff with the proper mix of technical and interpersonal skills is a prerequisite to establishing a successful IC.

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EXHIBIT II-2

REQUIREMENTS FOR A SUCCESSFUL INFORMATION CENTER

- Balanced Software Portfolio

SOFTWARE GROUP	EXAMPLES
Personal Computing	Spread-sheet, Electronic Mail, Text Processing
Fourth Generation Language	Graphics, Modelling Forecasting, Statistics
Programmer Support	DBMS, Programming Language

- Rich Support Environment

SUPPORT TYPE	EXAMPLES
Direct User Support	Hot Line, Training
Information Center Consulting	Solution Identification, Implementation Assistance

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C. IC IS THE BRIDGE TO USER SATISFACTION

- The IC offers corporations a method of breaking away from many of the unsatisfactory aspects of conventional data processing systems.

- The information systems (IS) departments can benefit by obtaining greater positive recognition than is generally possible today.

- The IC should operate as a service organization within the IS department. It is imperative that the IC have the necessary resources to keep up with the demand, as seen in Exhibit II-3.

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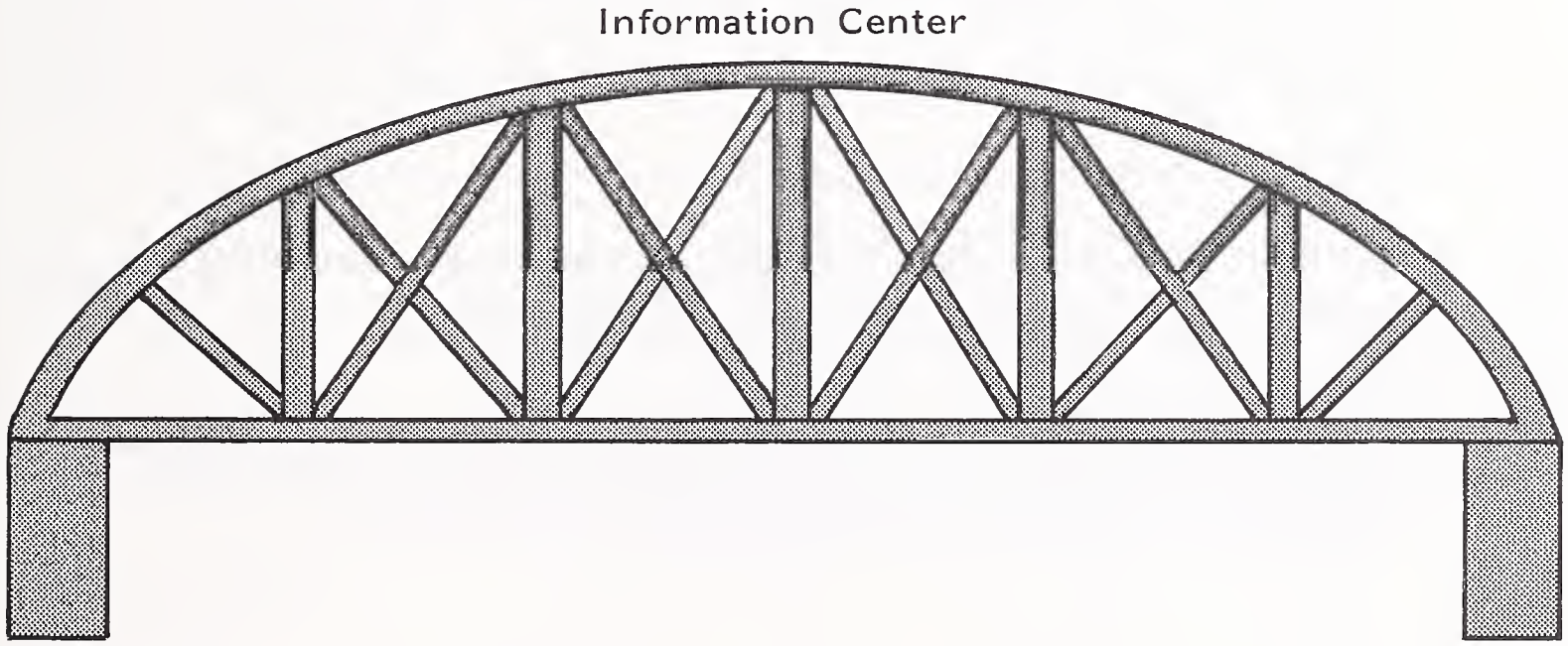
EXHIBIT II-3

INFORMATION CENTER:
BRIDGE TO USER SATISFACTION



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D. IC BENEFITS ARE TWO SIDES OF THE SAME COIN

- Tensions can exist between IS and users. They often do not place the same value on a particular benefit, as seen in Exhibit II-4.

- Generally, IS focuses on the technical benefits. It does not have strong views on the issues of overall productivity and decision making. Many IS departments have ambivalent views on end-user control and direct user access to corporate information. Here they are in potential direct conflict with user views.

- End users have no particular interest in increased software productivity, per se. They care about results and when they will get them.

- Be aware of the divergence in user and IS needs. Treat IC users as customers; their perception should be that their needs have top priority.

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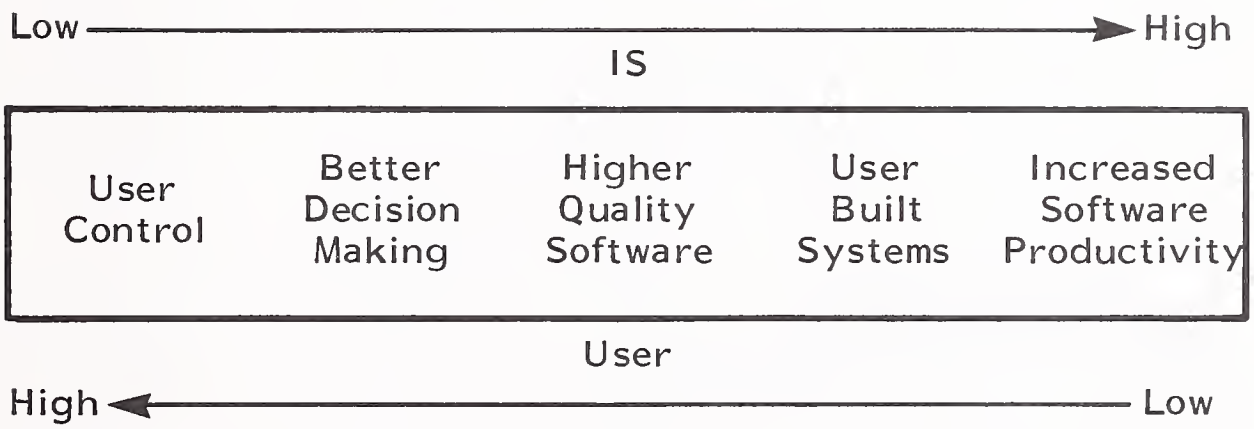
EXHIBIT II-4

INFORMATION CENTER BENEFITS



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E. IC COMPETITION

- Despite the IC's real and potential benefits, it still faces competition from two sources: commercial remote computing services (RCS) and personal computers (PCs), as seen in Exhibit II-5.

- Commercial RCS firms with traditional products will find it difficult to compete against a well functioning IC. The IC's advantages include:

  - Providing access to corporate data.

  - Lower cost than RCS.

  - It is not always trying to sell something.

- There is a burgeoning battle between centralized (IC) and decentralized (PC) solutions. As PCs mature, they will become even more attractive than they are now. The IC, however, can offer at least as much functional capability as a PC and sometimes even more. Also, the IC can act as the support for PCs.

- The biggest problem facing the IC is that the two separate competitors are merging into one: RCS vendors who are pushing PC-based solutions. This heightens the need for IC to develop its internal consulting to provide users with the same alternatives.

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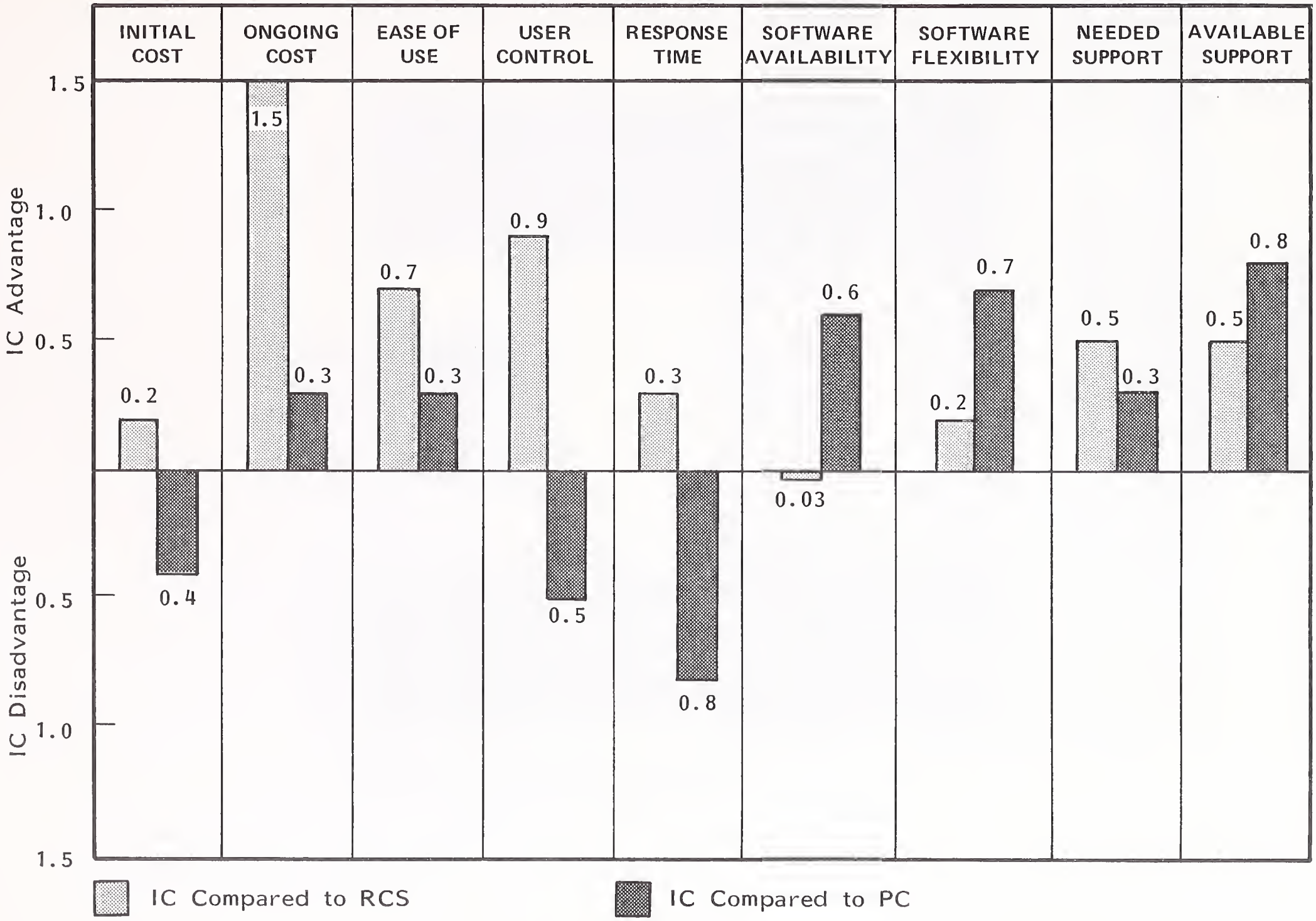
EXHIBIT II-5

INFORMATION CENTER COMPARED TO RCS AND PERSONAL COMPUTERS



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F. SUPPORT STAFF WILL GROW TOO SLOWLY

- The growth rate in ICs is expected to be high in the near term. The number of users is expected to increase by 400% from 1983 to 1985, as seen in Exhibit II-6. The clerical use is expected to be highest. This probably reflects the expectations that some work can be off-loaded from professionals to clerks.

- The growth rate is approximately the same for terminals used for IC purposes. Terminals shared with other functions are expected to predominate. By far the largest growth is expected in PCs tied to the IC.

- The growth rate for IC support staff, however, is projected to grow only about 25% as fast as the increase in users and terminals. This could be the harbinger of inadequate user support. Thus, the IC may neither fulfill user expectations nor reap many of the potential benefits.

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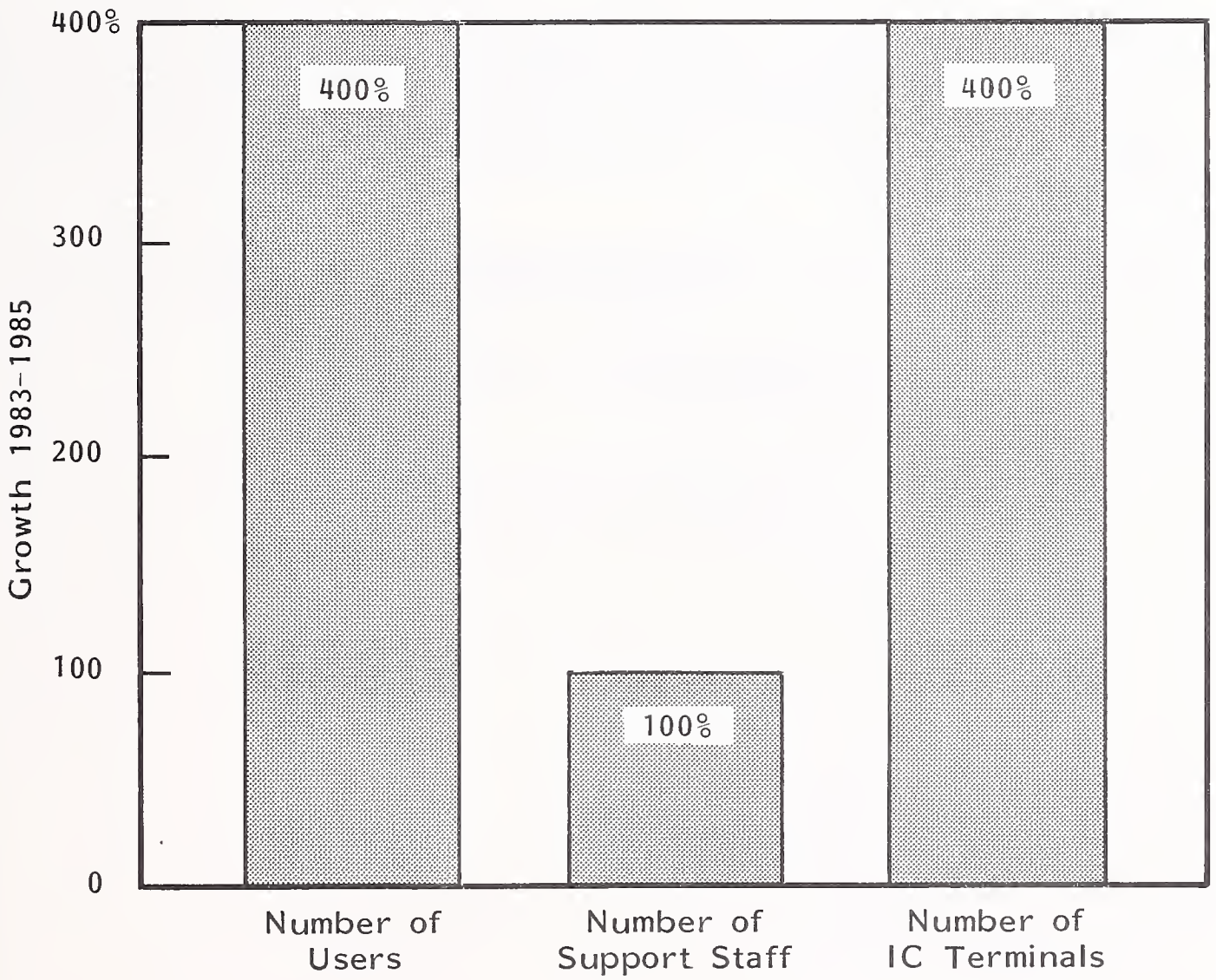
EXHIBIT II-6

INFORMATION CENTER GROWTH CHARACTERISTICS, 1983-1985



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G. PRICING STRATEGY TO CONTROL GROWTH

- Pricing can be used to limit growth. A more positive use of pricing, however, is to have the IC become self-financing. Pricing also provides a mechanism for collecting information and allocating costs, as seen in Exhibit II-7.

- The IC pricing mechanism should be perceived by users as being fair. There should be a reasonable relationship to actual services received and costs incurred. Price levels should be reasonably close to those of alternative sources, preferably lower. The charges also should be included in the users' administrative budget.

- The following major areas of IC service should have the costs covered for:

  - Data processing services.

  - Training.

  - Hotline support.

  - Consulting.

  - Technical support.

  - Documentation.

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EXHIBIT II-7

PRICING OBJECTIVES FOR INFORMATION CENTERS

- Pricing can control growth and finance the IC
- Charges must be fair
- Charges must be realistic
- Prices must be competitive

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H. THE INFORMATION CENTER'S EVOLUTION

- A service-oriented IC is a decided advantage over in-house timesharing; however, there are at least two more levels of the IC evolution: ICII and ICIII.

- ICII would integrate PCs and prototyping. Support would be more efficient, using computer-based training and extensive help facilities built into the IC software.

- ICIII is more speculative and would integrate much more intelligence into the system. Voice input and output as well as graphics design tools would directly support user integration with the IC. Artificial intelligence functions would be included.

- The IC can remove the roadblocks facing conventional data processing. It can be the vehicle to convert IS from a perceived adversary to an ally of the user community, particularly at the professional and managerial ends.

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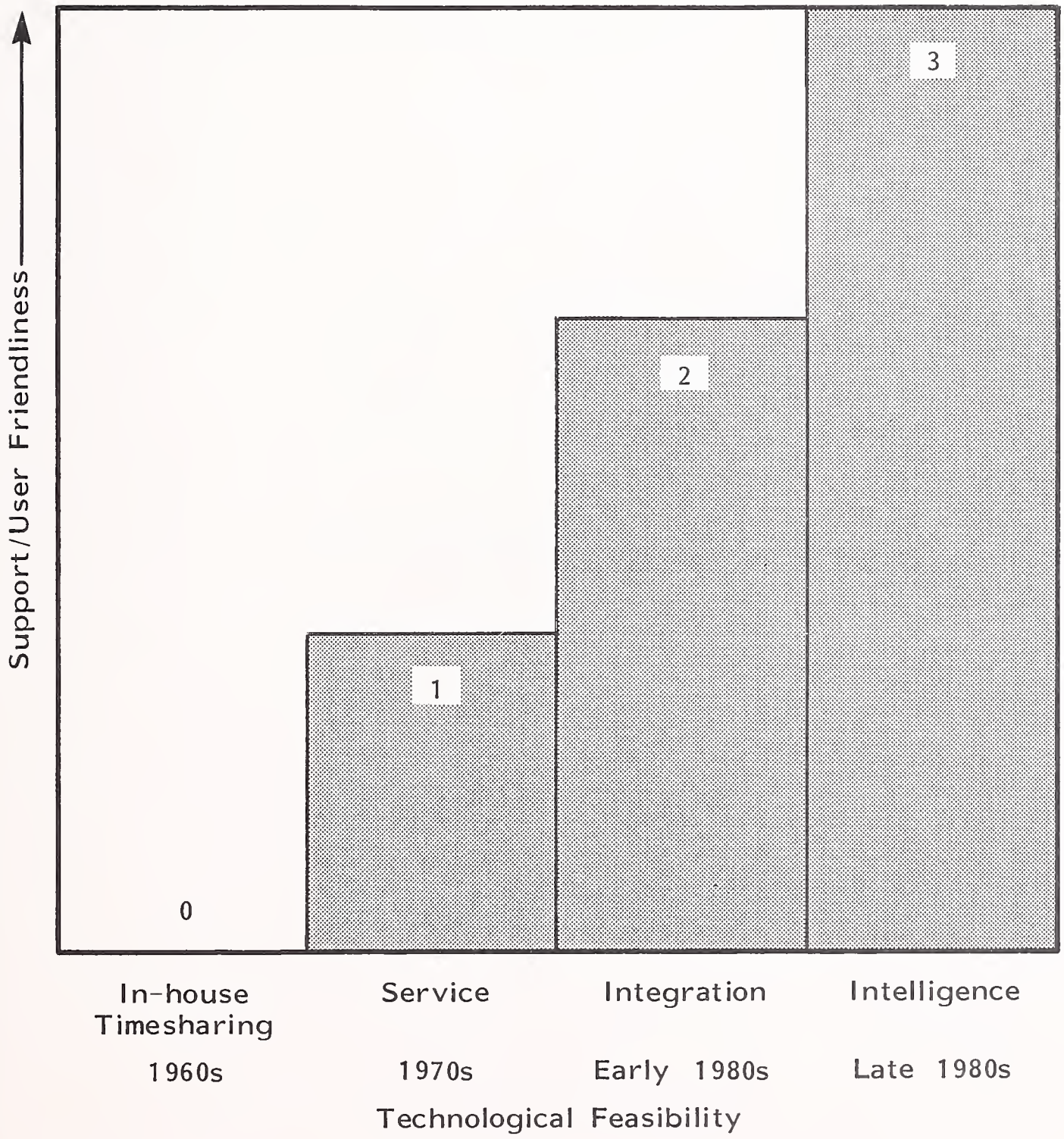
EXHIBIT II-8

INFORMATION CENTER'S EVOLUTION



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III SUCCESSFUL INFORMATION CENTER STRATEGIES

III SUCCESSFUL INFORMATION CENTER STRATEGIES

- This chapter examines what is involved in getting an IC underway successfully, and improving existing ICs.

  - Section A examines the primary functions that go into a successful IC.

  - Section B describes the process for actually implementing an IC. This section could also be called "marketing the information center" since general marketing principles will often make the difference between a merely adequate IC and one that is extremely successful.

  - Section C summarizes the interrelationships between the different IC functions.

A. INFORMATION CENTER ELEMENTS

- The primary elements contained in the IC are:

  - A software portfolio.

  - Necessary hardware resources.

  - Data resources.

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- Support staff.

I. THE SOFTWARE PORTFOLIO

a. Software Package Toolkit

- The concept of a "portfolio" of software is a critical element of IC success. The attitude in some IS departments is that it is desirable to offer as large a variety of software as possible to IC users.

- This is a fallacy, since the result is a confusing overlap of different packages and options which cause the following problems:

  - Support provided by IS is less efficient and there is more overhead.

    . Additional vendor training of IS support staff is needed.

    . Overlapping training is provided to users, either by vendors - at a price - or by IS staff.

    . Individual IS support staff members will find it more difficult to become expert in any particular software package or language.

    . Time will be expanded, usually with little ultimate return, in deciding which particular package/language is best suited for a particular job.

  - Users are less able to share knowledge and help one another, where they have chosen to use similar, but different, software tools.

  - On a technical level:

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  - . Fewer common code modules will exist (e.g., if divided between different fourth generation languages) and, consequently, libraries of reusable code will be less attractive.

  - . Sharing of common data and data bases will be harder, sometimes impossible.

- There will be more vendor interactions.

- Total software expense will be higher.

- Any one vendor will be somewhat less willing to exert itself in the IC's behalf, since it does not represent a large base of business or is not a model installation that can be used for marketing purposes.

- The goal of the portfolio approach is to have a selection of software available that will cover almost all needs very well, but perhaps no single need perfectly.

  - For example, while the various fourth generation languages have their strong and weak points, they all provide a common core of functionality. Installations that offer more than one fourth generation language usually find that most users ultimately settle on one fourth generation language. (The characteristics of individual fourth generation languages will be analyzed in detail in INPUT's upcoming report on the subject.) In fact, the unhappy history of IS departments that have selected or inherited more than one high-level language shows why the same state of affairs should be avoided for other software products in the IC software portfolio.

  - Consequently, in most cases, the IC will be best served by selecting one particular software tool in each of the categories. There are three general categories, as shown in Exhibit III-1.

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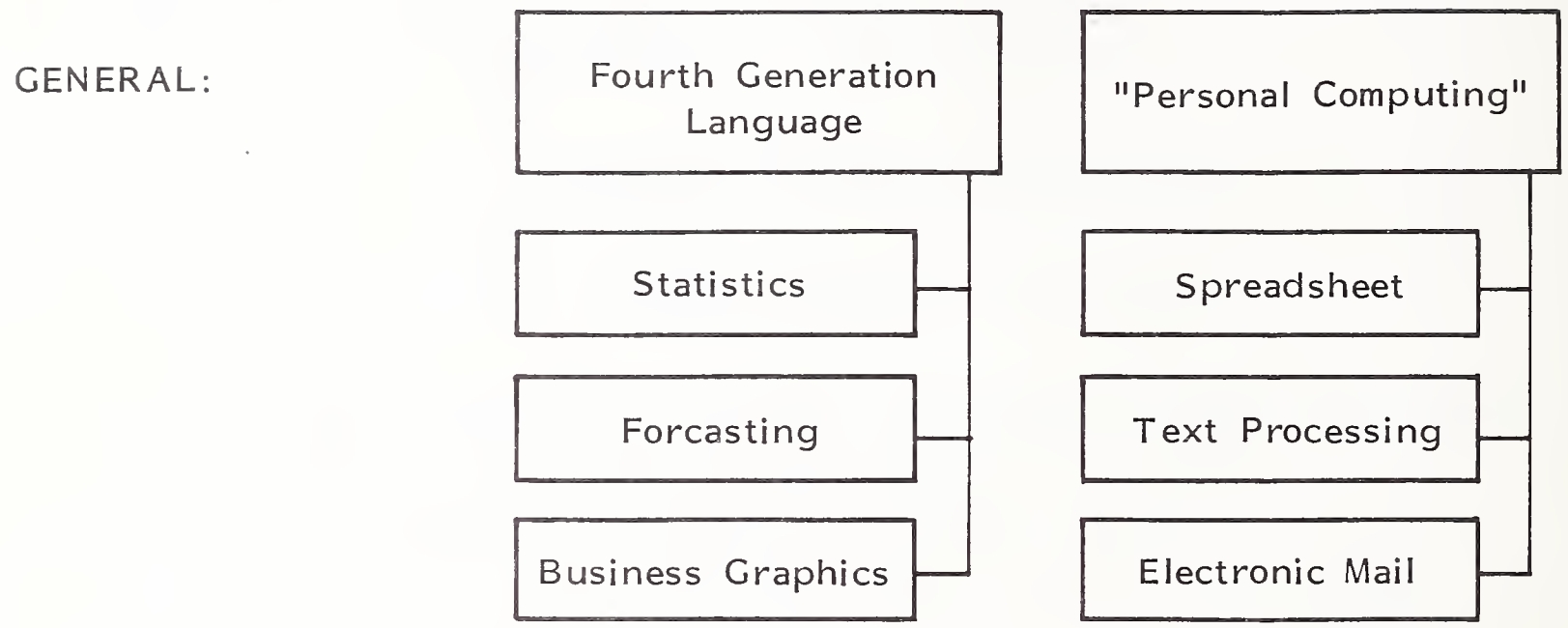
EXHIBIT III-1

INFORMATION CENTER SOFTWARE PORTFOLIO



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- General purpose software.
  - Fourth generation language.
  - Personal computing.
- Application specific software.
- Programmer support software.

- For example, the fourth generation language selected should have interfaces between statistics, forecasting and business graphics/software. All too often these packages are acquired without any advance planning as to how they will fit together. Retrofits are expensive and, often, unsettling to users.

- The "personal computing" category is not necessarily meant to be a competitor or replacement to PCs (a topic that is discussed at greater length in Chapter IV). However, it will often be easier or more convenient to use these tools in the IC environment, where, for example, data is being created or modified.

- Electronic mail is something of a "dark horse" in the IC: increasing numbers of people in an organization have access to, and learn how to use, a terminal. It becomes natural to use IC facilities to exchange messages and become a replacement for other kinds of communication. Consequently, selecting an electronic mail system should not be an afterthought.

- The application-specific software tools will, of course, depend on the type of company, department and user involved. Whether it is an engineering or general business environment, the same principles hold true: a single tool for a particular need should be selected.

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- As indicated later in this chapter, programmer support is somewhat foreign to the concept of the IC. In general, the main tools used elsewhere in program development will also have to be included in the IC.

b. Company-specific Software

- The "toolkit" in the previous section allows users (and other IS staff) to create applications.

  - IS staff may limit itself to using conventional programming languages (although some IS departments are beginning to question this).

  - Users will be creating what are, in essence, programs, even if they do not think of their products in these terms.

- Unfortunately, in most organizations with several years experience in using IC, prior work is almost impossible to reuse. This is because no method has been established for tracking and categorizing user-built programs and modules.

  - One organization has tens of thousands of fourth generation language modules that have been created in an on-line environment. There is, however, no feasible way for users to identify these modules for reuse; reuse only occurs where a prospective user learns of a compatible module by word of mouth.

  - In contrast, there are large libraries of scientific and engineering modules available in categorized libraries. This difference is due, in part, to the fact that these scientific/engineering modules put previously known algorithms and formulas into code form; the code can also usually be tested against known results.

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- Hence, any analogue to scientific and engineering libraries for business operations will not be easy to construct.

  . Among other factors, the way such modules are used, especially for business applications, will often change from user to user.

  . Another related problem is that the validity and robustness of such modules will often be open to question. People will often prefer to do things over in order to make sure that a module does what it is supposed to do. Actually, of course, this just means that they make a new mistake rather than accepting someone else's mistake.

- In spite of these problems, reusable modules can make sense in an end user environment. In some ways, reusable modules are particularly suited to the end user environment:

  - End users have far fewer ego problems in just copying someone else's code than professional programmers.

  - Often, while copying might not be appropriate, an existing module can be used as a template in order to develop a variant to fill the new need.

    . The template approach is especially suited for end users who have neither the time nor background to create an application from scratch.

    . Encouraging the use of templates will have attractions to IS as well, since in the absence of a suitable template, a user will often be forced to turn to the IS support staff.

  - A reusable module library can also serve as an education and training tool for end users, either directly through browsing or indirectly via

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formal training. Trainers can use these live programs as examples of good and bad practice.

- Besides being used as ad hoc examples of good and bad practice, the module library catalog can also be used for management level reports:

  . Department management can know how the IC center is being used by its staff. Management will learn of valuable computerized procedures implemented by their department.

  . Perhaps even more useful will be the ability to see how other departments are using computerized tools.

  . IS management can use it to evaluate and plan IC uses.

c. Software Module Identification

- In order to build a library of potentially reusable modules, it is necessary to first identify them. After this information has been captured, it can then be placed in a software module data base.

- Exhibit III-2 shows the kind of data that must be acquired from each module. On first glance this may seem like overkill since the amount of data collected may be larger than some of the modules being described.

  - Note, though, that a number of elements could be reasonably expected to be collected automatically in the course of normal IC use.

  - Other elements will change rarely or be part of a small menu.

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EXHIBIT III-2

SOFTWARE MODULE IDENTIFICATION

- Creator Information
  - -*Department
  - -*Person(s)
  - - Dates
    - •*Creation
    - •*Modification
  - - Type of Use:
    - • One Time
    - • Ongoing
- Subsequent Users/Adaptors
  - -*Department(s)
    - •*Person(s)
    - •*Dates of Initial/Subsequent Modification
  - - Type of Use:
    - • One Time
    - • Ongoing
- Brief Narrative (Optional)
- Security Status
  - - Personal Use Only
  - - Department Use Only
  - - Approved Access
  - - Unlimited Access
- Type of Use
  - - Algorithm
  - - Report
  - - Transformation (e.g., Consolidation)
- Data Elements Used
  - -*Input
  - -*Output
- Classification
  - - Functions
  - - Applications
- Quality Assurance Status
  - - Tested Against Following Standard
  - - Results of Test Available in

* Subject to Automatic Acquisition.

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- Even where there is, potentially, a large list of choices ("functions" and "applications") in practice, those affecting or used by a particular department will be relatively few.

- This type of activity is one that increases the value of a particular organization's IC compared to solutions like RCS or PCs.

2. HARDWARE RESOURCES

a. Type Needed

- While the phrase "information center" was coined by IBM, there is, in principle, no reason why an IC could not be run in a non-IBM environment.

  - MAPPER (developed by Univac) is an early example of the power and ease of use possible in a mainframe environment.

  - DTSS (on Honeywell equipment) was one of the first successful timesharing environments.

  - Much RCS is still done in a non-IBM environment (DEC, Burroughs, etc.).

  - Non-IBM hardware, as a class, has historically been more efficient than IBM equipment in a timesharing environment. This was of critical importance when mainframe resources were a scarce, expensive resource. In addition, the IBM operating systems have been difficult to work with for IS technical staff and users alike.

  - The major minicomputer manufacturers have developed integrated office support environments with many of the same characteristics of the IC.

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- Much of this is history now. Machine cycles continue to plummet in cost, making absolute hardware efficiency less important. While MVS, TSO, etc., are not much easier to deal with directly, they are now robust and, more importantly, can be masked from the end user as required.

- The most important factor is that no hardware vendor's software can be solely relied upon to construct an adequate software portfolio. Independent vendor products will be the software of choice much of the time.

  - Virtually all the reasonable candidates for an IC software portfolio from independent software vendors are IBM (and only IBM) compatible.

  - Consequently, in the real world, the IC and IBM compatibility are synonymous.

- As noted, the most important actions that should be taken in IC development are those that ensure that end users are not exposed to vendor hardware/software issues and choices. These complexities are difficult enough for skilled IS personnel to deal with.

  - This is accomplished by:

    . Choosing the right software portfolio.

    . Developing user-oriented application interfaces.

    . Redesigning, if necessary, system interfaces (e.g., log-ons, error messages, etc.).

  - This may entail substantial work in some installations, where corporate interactive systems have been limited to program development or ad hoc projects to bring RCS in-house. This restructuring is critical to success when dealing with non-technical users, however.

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b. Amount of Hardware Resources Needed

- There are no formulas for estimating, in advance, the hardware resource needs of an IC. This is because there are many factors that can affect hardware resource demand:

  - Computational intensity: The amount of computational intensity can range from simple sorted-data reports to highly complex linear programming models. Until recently, it could safely be said that companies with a scientific/engineering bent would be more computing intensive; however, the increased popularity of quantitative business planning and forecasting make this no longer a viable assumption in many organizations. (See INPUT's Annual Information Services Industry Report for 1982, Chapter II.)

  - Data intensity: This is the opposite of computational intensity. Some business planners, for example, now wish to perform decision support analysis on extensive amounts of detailed, live data, rather than on extracts or summaries, as in the past.

  - Analytical versus transaction processing: IC functions are usually considered to be analysis oriented. This is certainly true as a general rule. However, some companies find that users are utilizing IC facilities to perform operations activities (ongoing report preparation, accounting, inventory, order entry). Some, although not all, of these applications are sensible IC applications.

  - Output type: The type of output used can have important effects on demands for IC resources, e.g., CRT, paper (single or multiple copies), graphics, etc. These output demands may change over time as, for example, users become more attuned to computer-generated graphics and local output becomes more practical.

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- Software efficiency: There are hardware/software trade-offs involved between an IC that is a programming language (APL) oriented and one that is FOCUS oriented. Unlike conventional data processing, where IS management could have a primary effect on language use, users will increasingly "vote with their feet" on language use, by gravitating toward a particular language or languages.

- User versus programmer use: Users are not under IS control and are also uninterested in efficient hardware utilization in and of itself. They see the question of billing and charges as being another separate issue. (The next subsection will discuss this point at greater length.)

- Intensity of use: This is largely a user issue - just how much will users make use of IC facilities? This will vary depending on management demands, user-friendliness, support, and pricing.

- Response time standards: The peak-load response-time standard that is expected or mandated will have a significant effect on hardware use.

- IC alternatives: This includes RCS, PCs and conventional (in-house) systems. The extent to which these are realistic, viable alternatives will have a strong impact on IC use. (This issue is discussed extensively in the next chapter.)

• Virtually all IC users begin tentatively and then build up to a fairly stable level of use.

- Unfortunately for planning purposes, this rate of increase (as well as the end point) can vary dramatically among individuals, departments, and companies.

- Exhibit III-3 shows this planning dilemma in graphic terms. Experience does show that the rate of growth and the end point are nearly always higher than IS departments have expected and planned for.

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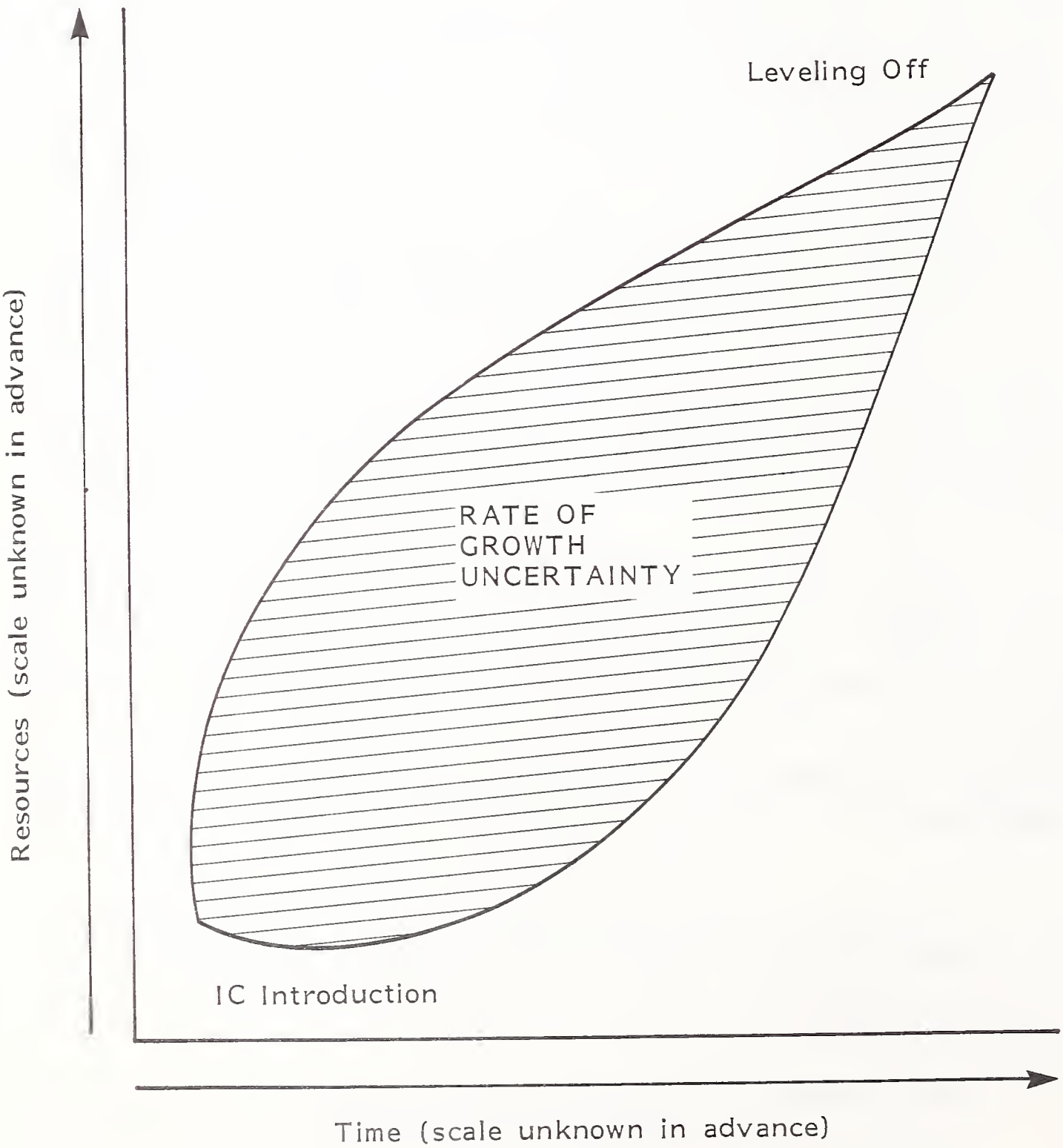
EXHIBIT III-3

USER DEMANDS IN ESTIMATING INFORMATION CENTER RESOURCES



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- Because of the difficulty in estimating resource requirements, it is imperative that an IC be first introduced in a pilot mode.

  - This will enable all the bugs to be worked out of the support process.

  - It also allows planners to see the usage profile in their organizations and plan accordingly.

  - Great care must be taken to limit use until hardware resources are available to handle increased workloads.

- Another problem, already well known to those who must plan for the resource needs of interactive systems is that there are distinct peaks and valleys of use, as shown in Exhibit III-4. These are closely related to the rhythm of the work day.

- There is more hope, however, for smoothing out the peaks of IC use than there is for other interactive systems:

  . Most current interactive system users are clerical staff using transaction systems. Modifying their work rhythms is very difficult.

  . In addition, these work patterns are often dictated by outside events (e.g., customers telephoning orders).

  . On the other hand, professionals using IC are much more flexible, and incentives can have a bigger impact on their behavior.

3. DATA RESOURCES

- There are two types of data resources that an IC requires:

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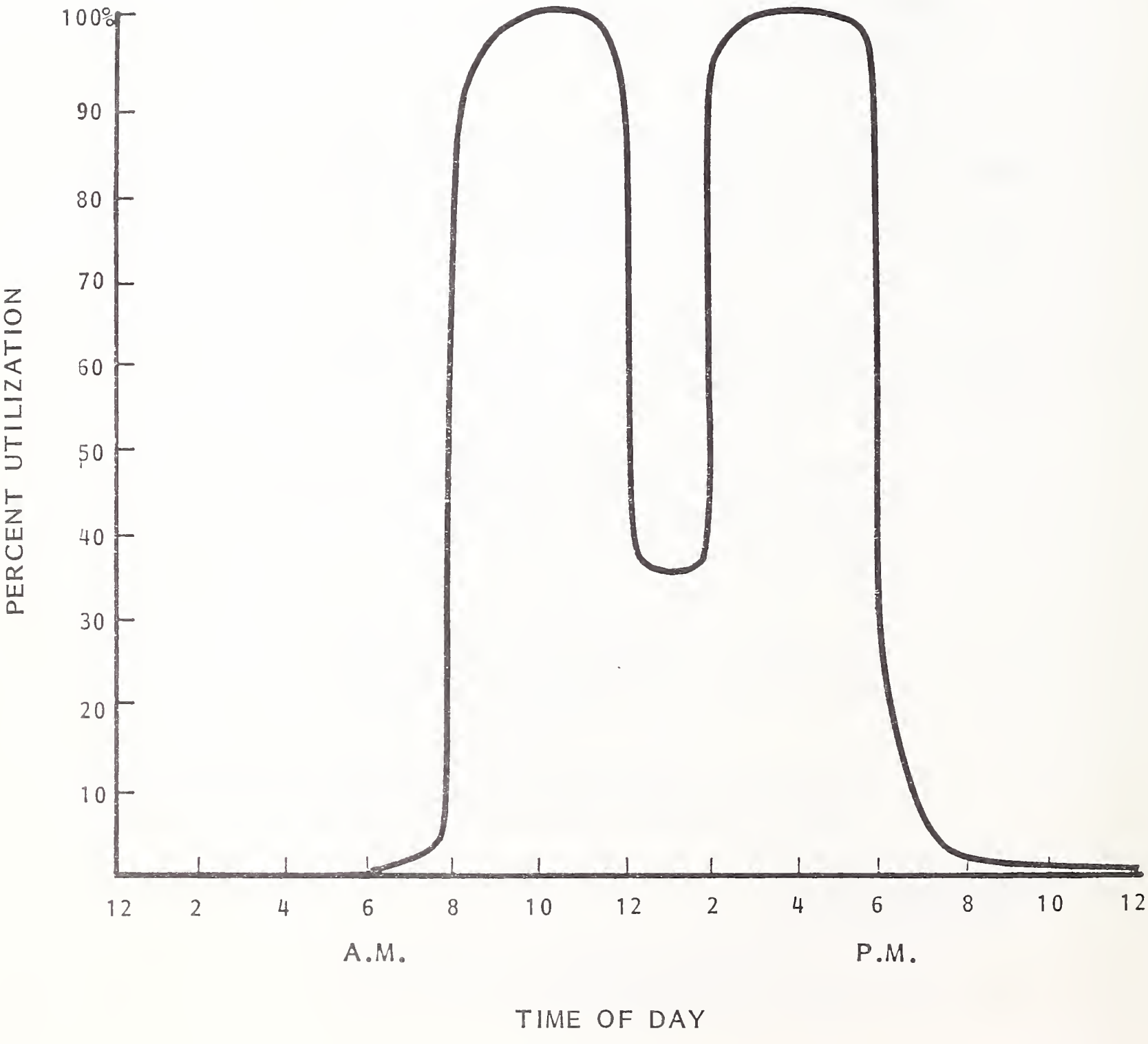
EXHIBIT III-4

INFORMATION CENTER USE: PEAKS AND VALLEYS



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INPU
UOIC

- External data.

- Internal data.

- External data is that which is obtained from commercial data base suppliers. Exhibit III-5 shows examples of the type of data available in a single area. IS could be responsible for identifying the data base needs of IC users and arranging for data base information to be supplied.

  - One problem with attempting this is where data base suppliers are often also RCS companies: they resist not getting the processing business as well.

  - Another problem is that IS may not always be an efficient intermediary in very technical data base areas. Data base vendors and users may have developed close working relationships over the years and IS may be treated like an intruder.

  - Consequently, it may not always be feasible for IS to serve as the intermediary in dealing with data base suppliers.

- Eventually, though, if IS does an effective job at organizing internal data, users will have little choice but to delegate all data aggregation to IS since internal and external data promise to become increasingly intertwined in most comapanies' information analysis areas.

- Collating and aggregating company operations data will be a key area of IS responsibility. Currently, much of this activity goes on in a relatively crude way; extracted data is dumped to tape and put up on the IC data base. Such approaches will become more sophisticated as:

  - Users demand more current data (e.g., IC-based operational systems).

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EXHIBIT III-5

EXAMPLES OF FINANCIAL INFORMATION DATA BASES

- Cates, Lyons, and Company maintains a historical data base of over 800 key financial data items on 250 major bank holding companies.
- Robinson-Humphrey Company maintains a data base of key financial items on 145 top bank holding companies. The data base is offered together with comparative analysis software.
- SBC maintains a financial institutions data base of financial information containing:
  - FDIC data on over 14,000 commercial banks.
  - FHLB data on over 4,500 savings and loans.
  - NCUA data on over 16,500 credit unions.
- Payment Systems, Inc., offers a data base through IDC containing statistics on major aspects of financial transaction systems, including ACH, ATM, credit cards, NOW and share draft accounts, and telephone bill paying systems. The data base also includes key money market indices and market attitudes data on both electronic and paper payment systems.
- Blyth, Eastman, Dillon, & Company maintains a financial data base that contains daily price and yield information on over 800 bonds and other money market instruments including U.S. Treasury notes.

SOURCE: ADAPTED FROM INPUT's REPORT, MARKET OPPORTUNITIES FOR DATA BASE SERVICES

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- Current operations-oriented systems are revised and take IC needs more fully into account.

- The sometimes multidimensional demands that the IC will place upon corporate data will greatly add to the complexity of the data administration function.

  - More and better data analysis and data analysis tools will be required to fulfill these requirements.

  - Sophisticated data analysis tools such as the Data Designer of Data Base Design, Inc., will be required to serve both operational users and IC users.

  - These issues become quite complex on a technical level where, for example, an information management system (IMS) data base and a FOCUS data base have to be kept reasonably consistent.

- The approach that a few companies have taken is to treat the two requirements (operation and IC) as one: they have constructed mainline, transaction-driven systems in fourth generation languages. With this approach, one can almost say that the IC has swallowed up the remains of traditional data processing.

4. SUPPORT FUNCTIONS

- The internally-focused IC support functions are little different than those used to support traditional data processing systems:

  - Operations staff.

  - Systems programming.

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- Software package functions.

- Data administration, i.e., guiding users to the correct data resource.

- In addition, the IC will draw on the expertise of IS experts in such areas as:

  - Data base administration.

  - Communications.

  - Capacity planning.

  - Security (both hardware and data).

a. Direct User Support

- It is in the user interface area that the IC shows its true colors. This will be the area that most IS departments will find the hardest to adjust to since these services are much richer than those IS usually provides.

- Users will obviously require training to use IC facilities. This has historically been time consuming and expensive since such training has been provided live. There are reasons why training cannot and should not be stinted on:

  - Most importantly, without effective training the IC will neither be, nor appear to be, a success.

  - Inadequate training merely pushes the demand back into "hotline"/"help desk" support.

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  - . It is much more expensive to provide education after the fact via the hotline than up front where it belongs.

  - . At best, users are unhappy to have to get training in dribs and drabs via the hotline.

  - . At worst, and most usually, these training demands overwhelm the hotline, and it cannot perform its primary functions of identifying and resolving unforeseen problems.

- Light is on the horizon in that some vendors are beginning to supply training for their products interactively (e.g., COMSHARE, Information Builders).

- Much IC training on company-unique features can also be supplied on videotape.

- Hotline personnel provide quick response assistance to user queries. These can include:

  - Lack of understanding of IC product use (which should be noted for training improvement).

  - Queries on new applications of IC products.

  - Real or apparent software or hardware problems.

- Behind the "front line" hotline will be software experts who can advise users of the advantages of particular software products.

- Both the training and hotline functions can be filled with non-IS personnel.

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- Selected user staff may be recruited. These people can provide a critical user orientation.

- Non-technical college graduates can do a superior job if provided with sufficient training.

- Carefully selected junior IS staff can also do a good job. They must be careful not to be too technical; however, this proves impossible for many IS people. For those who can do it properly, this kind of work provides a real growth experience and can prepare them for very responsible positions.

- Non-IS staff can often adjust more quickly to IC needs, especially to the fourth generation language environment.

- These external support functions can be patterned after those of RCS companies in two ways:

  - The support provided should be knowledgeable, professional and quick. High quality support is one of the reasons why RCS firms have succeeded (and are still succeeding) in taking work away from traditional IS operations.

  - RCS companies estimate that they need one support person for every 50-100 customer users. This general level of support should be the target for successful IC undertakings.

- One reason why there is a requirement for a very rich support staff function, is that the uses to which the IC will be put, are so varied.

  - INPUT estimates, based on experience of several advanced ICs, show that a typical "mature" IC (i.e., settled into place and serving a varied mix of users) will support significant amounts of user activity in

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decision support functions, prototyping and report production, as shown in Exhibit III-6.

- In addition, there will be transaction processing, office communications and other miscellaneous activities (independent word processing, self-contained data bases, etc.).

b. Information Center Consulting

- ICs can provide two other types of support to users:
  - Senior consulting assistance in identifying the appropriate solution to user needs.
  - Junior consulting assistance in implementing IC-based solutions.
- Users, if left to their own devices, may "solve" their problems by applying solutions chosen almost at random, i.e.:
  - A traditional data processing system.
  - The IC.
  - Personal computers.
  - RCS.
- In part, this is because most IS departments have only been able to provide one service - the traditional data processing system, and that usually required, at the least, a wait of many months. Under those circumstances users felt that any solution, no matter how flawed, was better than no solution.

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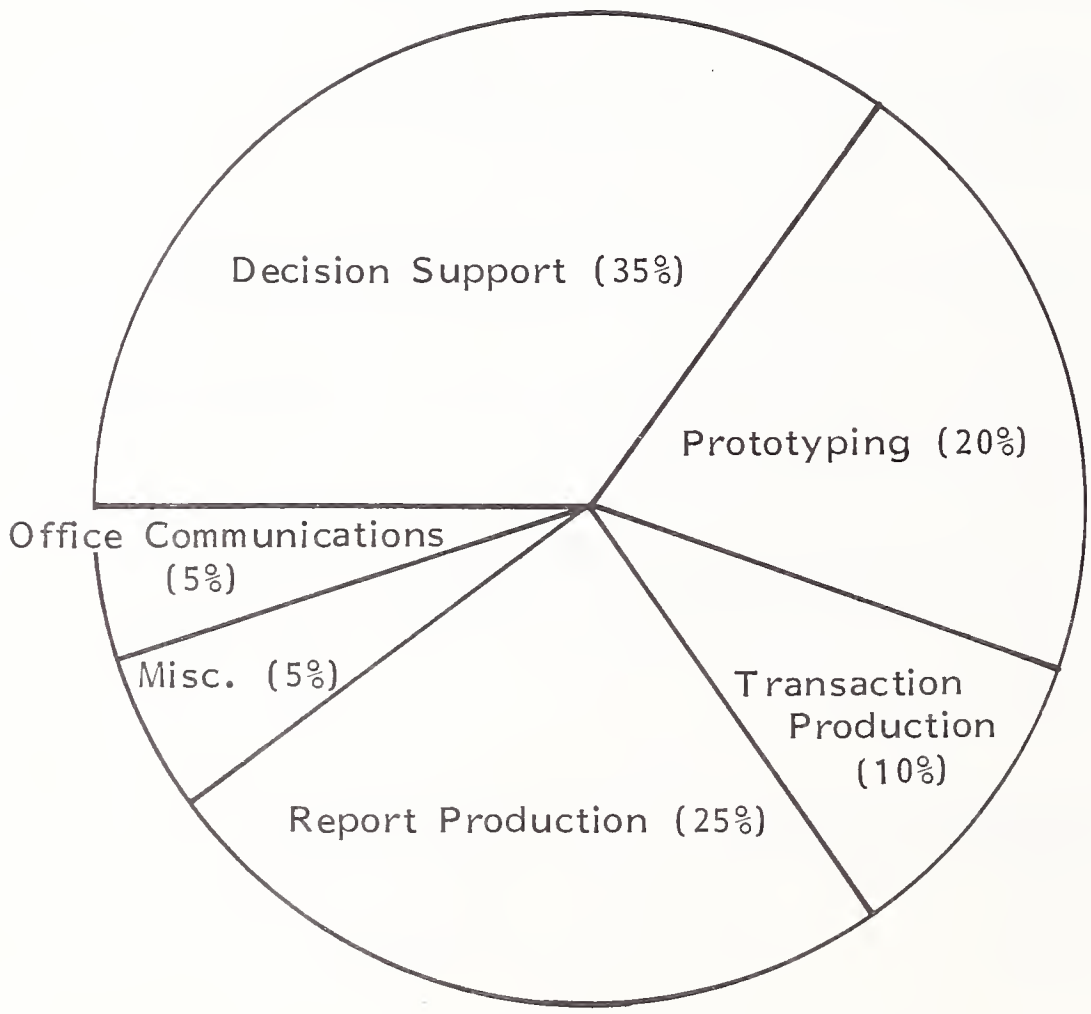
EXHIBIT III-6

TYPICAL INFORMATION CENTER USER APPLICATIONS



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- Users would be very receptive to impartial advice about the best solution.

  - IS departments with a strong IC operation could provide this kind of advice in at least two major areas (i.e., traditional data processing and the IC).

  - IS departments that offered a similar service for PCs, would be able to offer an even broader range of advice. (See INPUT's August 1983 report, Supporting Personal Computer Software).

  - IS would not be perceived as offering impartial advice on the subject of RCS so there is usually little reason for its attempting to do so. In many cases, where IS has a sound IC program, there would be little reason to consider RCS.

- Consequently, IS would be providing a very desirable service both to itself and to its users by offering this kind of IC-based consulting.

  - These senior consultants would have extensive backgrounds in application systems and would be knowledgeable in IC offerings.

  - Ideally, there would be similar PC experience to draw on also, but probably not from the same persons.

- There is a school of thought that believes that IS should not actually provide programming services within the IC. This is too strict an interpretation of the concept of "end-user computing."

  - In other cases IS does not believe that operations-oriented systems belong in the IC. They do not intend to give their support to such an approach.

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- In addition, some IS departments and staff do not wish to get involved in "nonprofessional" fourth generation languages.

- INPUT has observed ICs being used successfully for a wide range of operations, or production-oriented systems.

- It is often preferable for IS to provide programming services rather than having them performed in an uncontrolled manner.

  . The user will attempt it alone and usually do a bad job.

  . An outside consultant of unknown quality will be hired.

  . An RCS firm may pull the job outside.

  . A worthwhile application will not be developed.

- The junior consultants can often be drawn from the same pool as other support staff or can be promoted from training and hotline staff.

- Exhibit III-7 summarizes the types of IC staffing required and the areas they can be drawn from.

B. IMPLEMENTING THE INFORMATION CENTER

1. OVERVIEW

- This section could just as well have been titled, "Marketing the Information Center," for two reasons:

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EXHIBIT III-7

INFORMATION CENTER STAFFING

STAFF TYPE	SOURCE
Operations	Current IS Operations Staff
Technical Support • Operating System - Communications - Systems Interface	IS Technical Support Staff (may be full-time on IC functions or part-time)
• IC Software Functions	IS Applications Programmers
User Interface • Sr. Consultants	IS Senior Analysts Initially; Promoted Jr. Consultants later
• Jr. Consultants	IS Junior Analysts; Retrained User Staff; New Hires
• Training, Hot Line Support Staff	New Hires; Retrained User Staff; IS Jr. Analysts

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- The steps to be described closely parallel those that should be taken to launch any new product or service, as shown in Exhibit III-8.

- IS will be far more likely to succeed if it views the IC as a business within the corporation, and the users of the IC as its customers. This is doubly true since one of the biggest challenges facing IS and the IC is the question of alternatives to the IC, especially the PC.

- IS departments which have an IC that is not performing as well as expected should review this section comparing the points here with those actually followed.

  - In many cases, it will prove worthwhile to start over again and "reintroduce" the information center in the right manner.

  - If this is done, then the repackaged entity should probably be given a new name also, so that all who are associated with it realize that there has been a new startup. The "Enhanced Information Center" would be an appropriate title.

2. DEFINING INFORMATION SYSTEMS GOALS AND TARGETS

- IS must have a clear picture of what it ultimately wants to achieve by offering an IC. Some of the goals of IS departments include:

  - Decreased backlogs.

  - Increased general user satisfaction.

  - Stretching IS personnel resources.

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EXHIBIT III-8

STEPS IN IMPLEMENTING THE INFORMATION CENTER

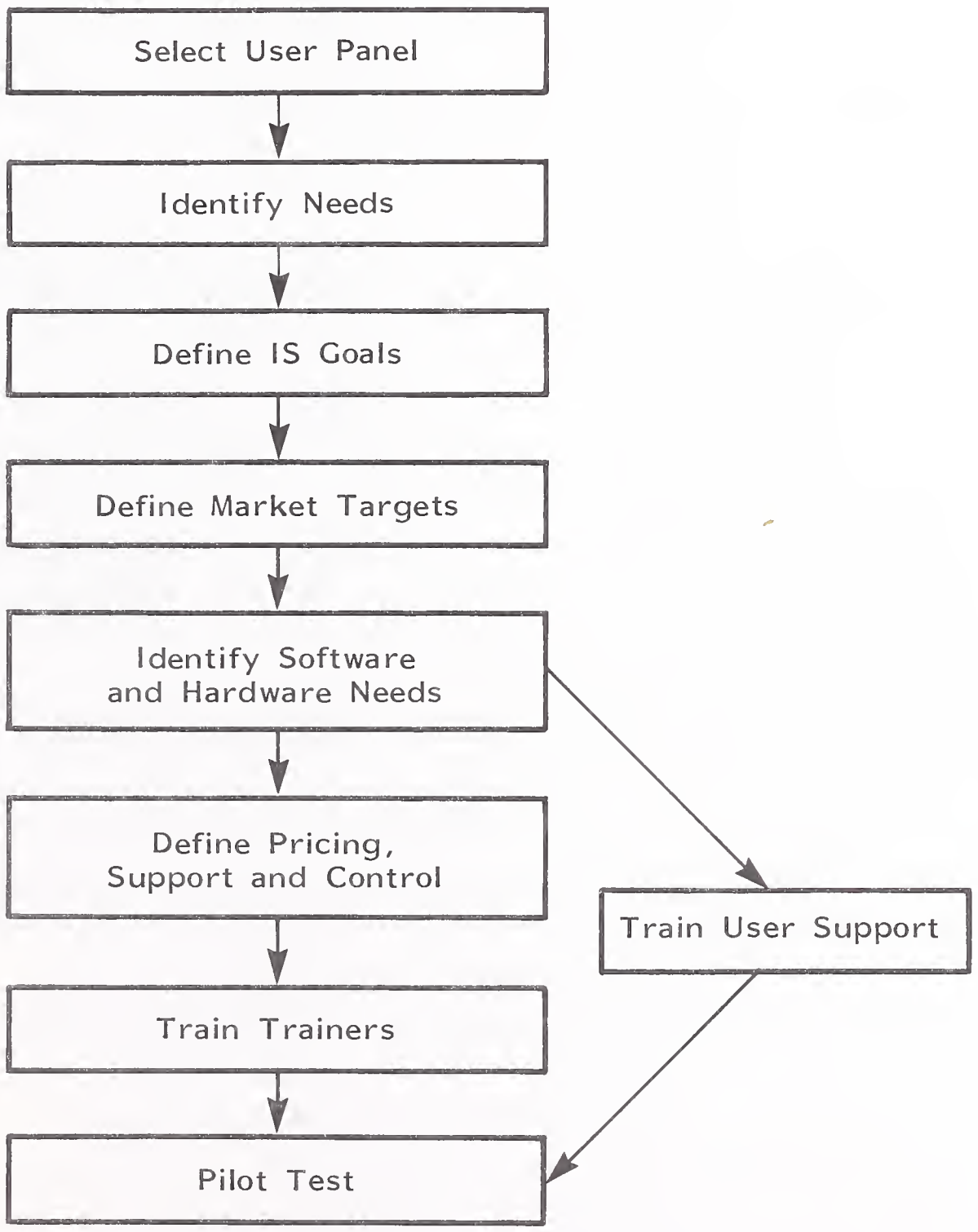

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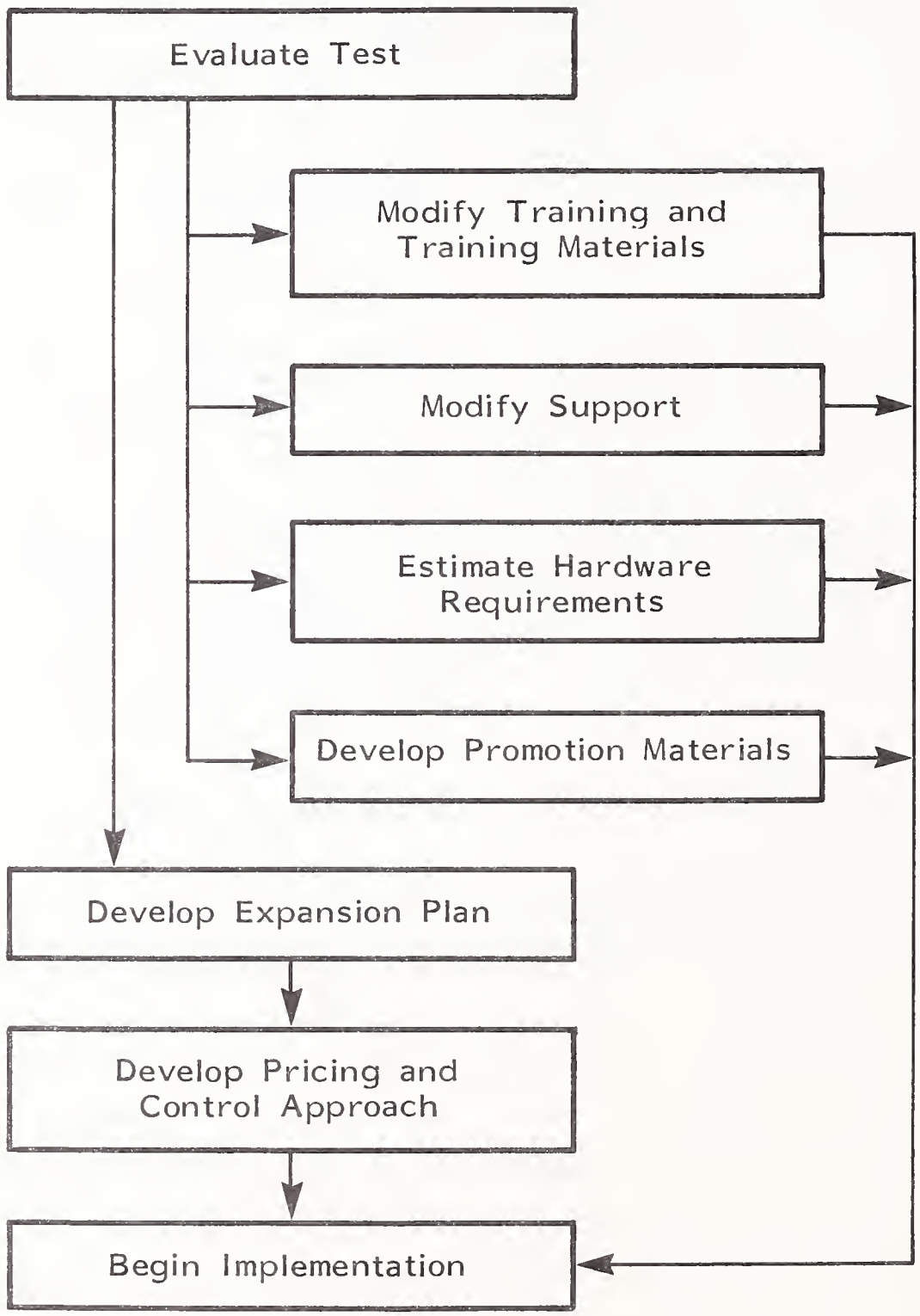
EXHIBIT III-8 (Cont.)

STEPS IN IMPLEMENTING THE INFORMATION CENTER



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- Introducing new technology.

- Reducing external RCS costs.

- Increasing IS activities.

- Involving users in data processing.

- Increased IS status.

- The important thing is that these should be goals and as explicit as possible. Otherwise IS will never know for sure that any of the goals have been achieved.

  - The very worst reason for starting an IC is to have no reason at all: "everyone else has one, so we should too"; or, "IBM says it's a good idea."

  - An IC started under the conditions of no explicit goals is virtually doomed to failure: it will never receive the minimum resources needed to lift it out of the "in-house timesharing" category.

- The market targets should be consistent with the goals set. For example:

  - If alleviating user dissatisfaction is a primary goal, then the most dissatisfied departments should be prime targets.

  - If backlog reduction is a goal, then the backlog should be analyzed to see areas which are most amenable to IC solutions. Note, however, that the IC often acts to reduce the invisible backlog, i.e., that is not entered into the official request process. This may or may not be concentrated in the same areas as the identified backlog.

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- If a reduction in RCS costs is a primary goal, then departments with the largest RCS budgets should be targets.

- Targets may even be individuals who are trend-setters or who have important positions, etc.

  - The most important thing is that targets should be identified. This is an unusual position for most IS departments to be in: generally, they must react to other departments' requests.

  - In the case of the IC, an IS department has the luxury of being able to choose its own targets.

  - The most common mistake in starting an information center is to have it be essentially first come, first served. This usually does not serve corporate needs and it certainly does not serve IS needs.

- After targets have been identified, these should be reviewed by an appropriate entity, if one exists (e.g., interested and informed top management, an IS steering committee, etc.). Two points should be made:

  - A potentially revolutionary event, this could have many, positive impacts throughout the corporation, as seen in Chapter V.

  - Precisely because of this potential, IS plans to introduce the IC in a controlled, adequately-supported manner.

3. IDENTIFYING NEEDS AND SOFTWARE

- As part of the marketing approach, IS should identify its targetted users' needs.

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- To do this IS should form a panel from key-user areas to help select the software portfolio most suitable to users' needs.

- A subset of this group would also serve as the pilot test group for the IC.

- Some prospective ICs may have to unlearn assumed knowledge about timesharing users. Many IS staff members, through experience or observation, identify timesharing with the use of timeshared resources to develop programs.

  - They might logically, but incorrectly, view the IC as an expansion of TSO facilities.

  - Apart from the user-unfriendliness of TSO, there is the more important distinction between programmers and non-programmers.

  - Exhibit III-9 highlights these differences.

- Consequently, even if programmers from a technical standpoint will be IC users, it is best to compartmentalize them from a planning standpoint and focus on end-user needs.

- The needs identification process may appear slow. The process could be speeded up by using IS staff or consultants with prior IC planning experience. However, if performed correctly, the needs analysis process will have two benefits that will compensate for the time spent:

  - A good software portfolio will have been acquired that is fully accepted by users.

  - The IC concept will have been communicated at key points in the organization.

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EXHIBIT III-9

THE INFORMATION CENTER DICHOTOMY : PROGRAMMERS AND END USERS

PROGRAMMERS	END USERS
• IC: Another Form of TSO	• No IC Expectations or Over Expectations
• Indifferent to User friendly Features	• Computer-phobia: User-friendliness Extremely Important
• Performance and Efficiency Oriented in Software	• Results Oriented, No Concern for Efficiency

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4. PILOT TEST

- Preparatory to the pilot test of the IC:
  - The software portfolio (or subset) will have been assembled.
  - Trainers will have been selected and trained.
  - Support staff will have been selected and trained.
- The pilot test group should consist of no more than 50 people, concentrated in several representative departments.
  - This will provide a "rich" level of support to compensate for staff inexperience and on-the-job training.
  - The test group should be in test mode for several months.
  - This will allow for a shake down in the support staff and for IS to observe the usage growth curve.
- If possible, the test should be scheduled to begin at a time when new hardware capacity has been installed. This means that hardware resource scarcity will not be an immediate factor and that IC and other systems will not be competing for resources.

5. TEST EVALUATION

- After the initial test group has been shaken down, the results should be evaluated. Typically, the following will occur:

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- Training gaps in coverage, knowledge and clarity will be identified and filled.

- Hotline procedures will be modified.

- Hardware resource adjustments will be estimated.

- Some personnel adjustments will be made.

- IS management will have to decide if its previously-set goals will be met.

- The bottom line will be whether IS management believes that user management:

  - Is satisfied with IC service.

  - Will willingly pay the costs associated with these new services. (See Chapter V for further discussion on pricing strategy.)

6. FULL IMPLEMENTATION

- Assuming that IS management believes that the IC will meet its goals, then the next step is implementation. This must be as closely planned as the test.

  - Capacities in the following areas should be projected for at least a year:

    . Hardware.

    . Training slots.

    . Hotline capacity.

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- If the IC is to offer consulting services as well, then its capacity and targets should be identified here.

- Professional brochures and demonstration material should be prepared. These should conform to corporate expectations and be neither too glossy (which might be equated to waste) nor too crude (which might be equated to a lack of preparation).

  - The purpose of these materials will be, at least partly, to maintain the IC staff's own business self-image, since a successful pilot will have generated the most potent of all promotional activities: word of mouth recommendations.

  - These materials should be tested in small groups before being used extensively.

- Since a well-organized IC is likely to suffer from a surfeit of business, IS should have strategies to deal with this "problem." In reality, it could be a serious problem since too many users could lower the quality of the service so much that the IC no longer would meet its original goals.

C. THE COMPLEXITY OF PROVIDING INFORMATION CENTER SERVICES

- Exhibit III-10 shows the interrelationships of providing IC services. These relationships are complicated; none of the functions can be done once and then forgotten.

  - One consequence of this is that the IC function needs full-time management, dedicated to the needs of the IC "business."

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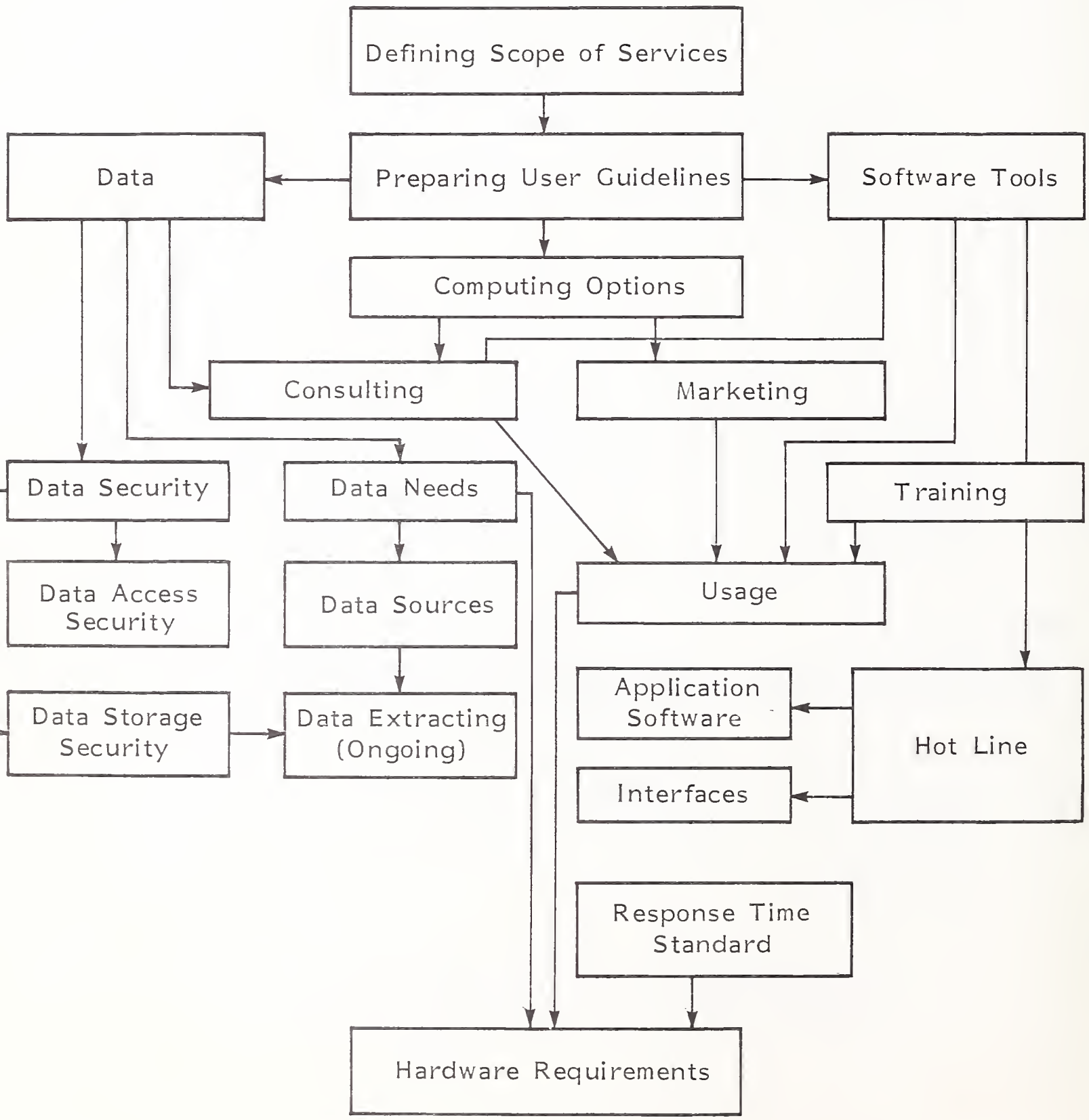
EXHIBIT III-10

INTERRELATIONSHIP OF INFORMATION CENTER FUNCTIONS



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- This management function is also complex, because the IC manager cannot have control over all the resources that serve the IC function. The IC is virtually an IS department in miniature.

- Exhibit III-11 shows one way in which the IC function could be organized.

  - Functioning under the IC manager should be a separate IC staff. If the IC has its own dedicated hardware, even some or all of the operations staff could be under IC control.

  - However, this is not necessary, even in a dedicated hardware environment, given a good understanding of IC needs by the operations staff.

  - Like any sort of matrixed management position it involves compromise.

  - The IC manager must have excellent people skills, since a major part of the job entails interaction with users as well as other parts of the IS organization.

- Ideally, the IC function should have dedicated hardware resources to fulfill its mandate. This will not always be practical since the IC will be constantly growing.

  - Dedicated hardware is also not a necessity. At the beginning, dedicated hardware will not usually be feasible.

  - After the IC is fully functional, dedicated hardware would be more convenient from the standpoint of management responsibility and the ability to control response time and other quality parameters.

  - However, dedicated hardware will usually be more expensive, since unused resources cannot be shared with other users. If capacity planning is adequate and if IC priorities can be met, shared resources can be quite an acceptable solution.

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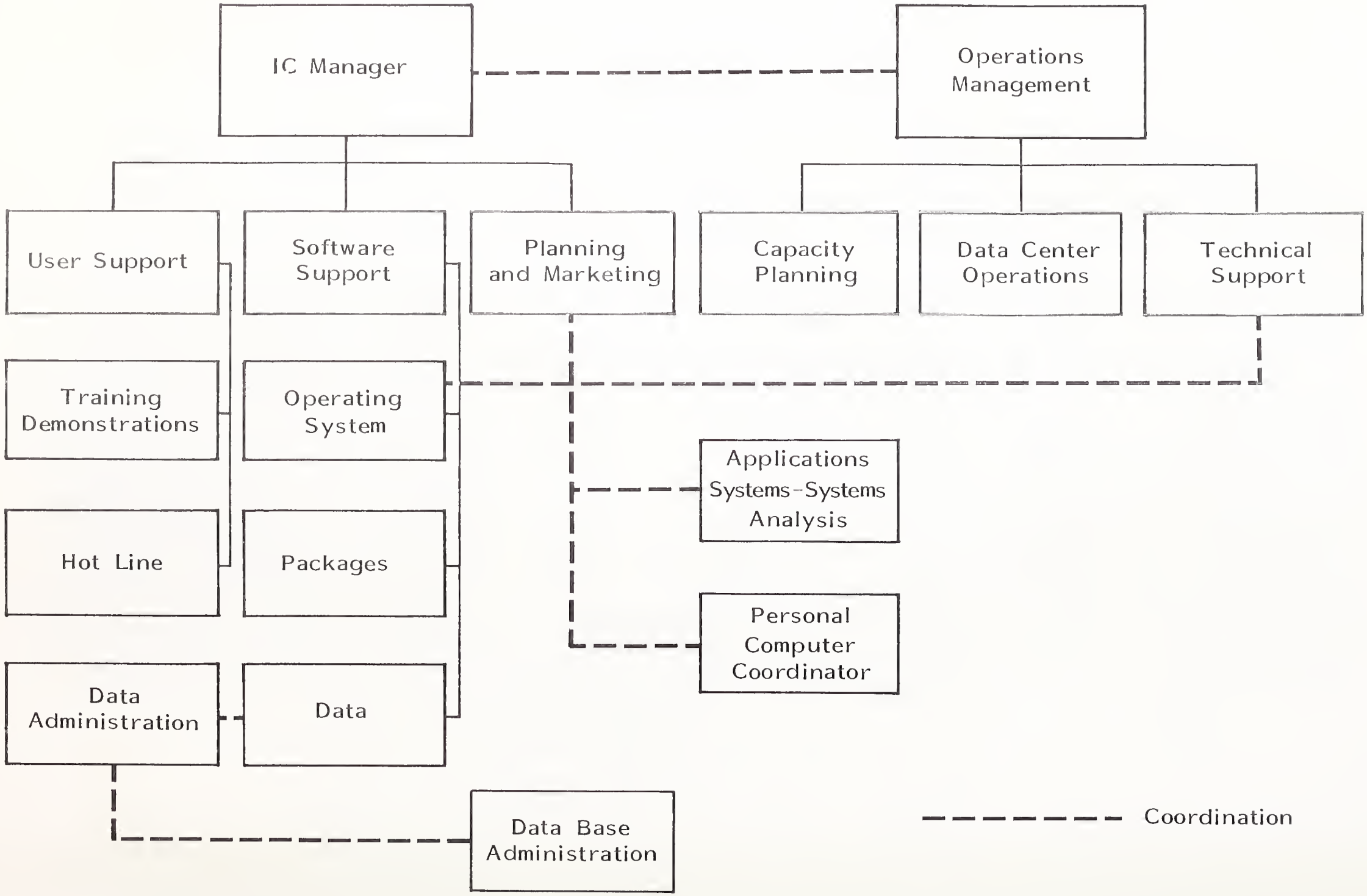
EXHIBIT III-11

INFORMATION CENTER ORGANIZATIONAL RELATIONSHIPS



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- Overall responsibility for "end-user computing" should be combined at an executive level as seen in Exhibit III-12. This implies very strongly that the IC should not be a computer center responsibility, since the key needs for PC support are not those which computer operations are best-placed to supply.

- There is little doubt that in many organizations, IC and PC functions will gradually coalesce.

  - However, from a hardware and software standpoint this is still several years away.

  - At that time, combined support will be a necessity.

  - Until the time that the two services draw closer together, there are few benefits to be gained from integrating the actual support operations.

- Similarly, office systems (OS) coordination and support will be in the "end-user computing" functions.

  - This should only be slightly in advance of the integration of O/S, PCs and ICs from a technical and user acceptance standpoint.

  - The chief reason for proceeding at a relatively slow pace in this area is that just developing an adequate IC will stretch most IS organizations' dollar and planning resources.

  - If hardware resources are shared, then it is the responsibility of the head of IS to make it clear to both the IC and operations managers exactly what resources will be available to IC; this should extend over a reasonable planning horizon (i.e., at least a year into the future).

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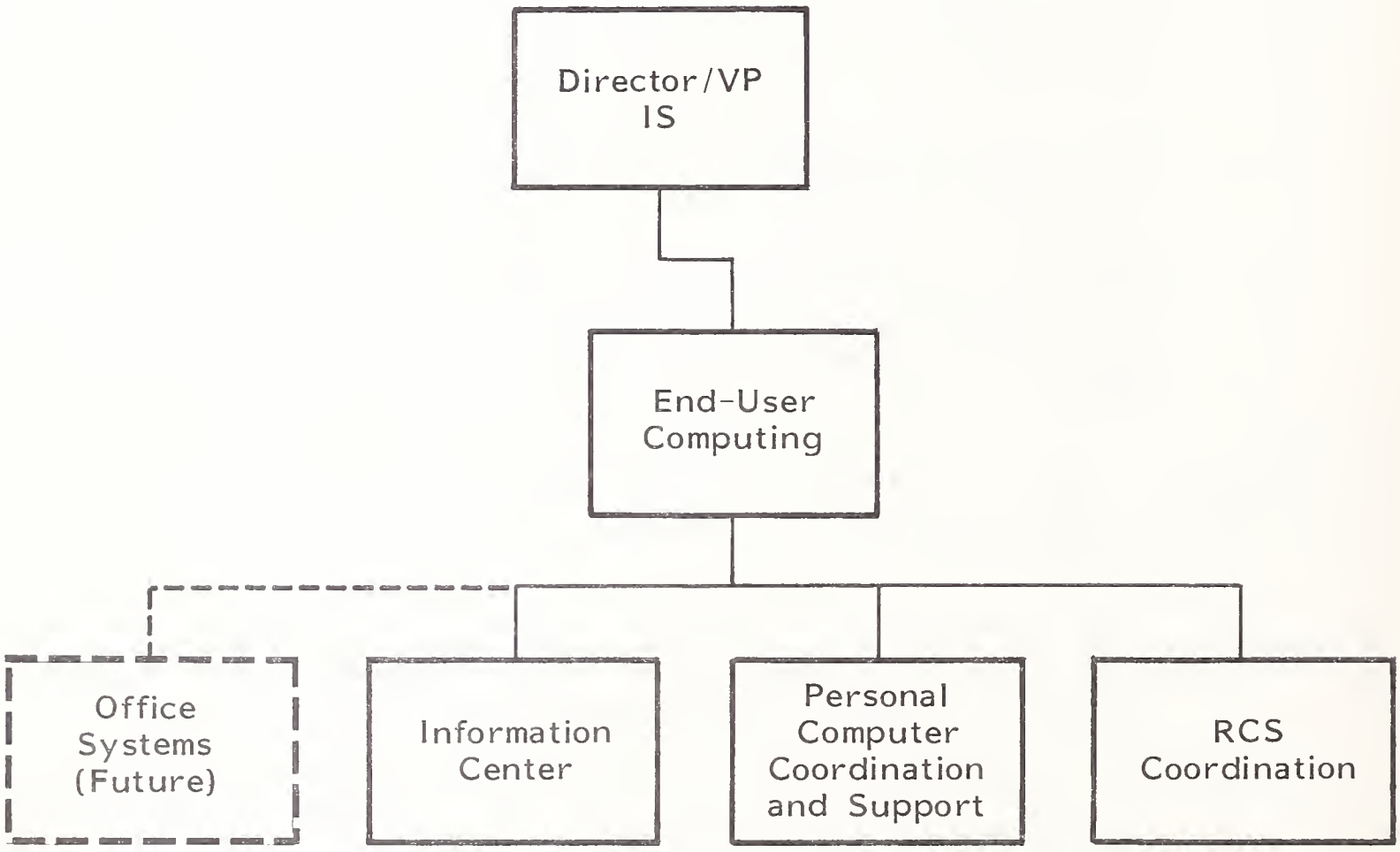
EXHIBIT III-12

INFORMATION SYSTEMS ORGANIZATION FOR END-USER COMPUTING



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IV THE INFORMATION CENTER'S COMPETITIVE POSITION

IV THE INFORMATION CENTER'S COMPETITIVE POSITION

- This chapter examines:
  - IC benefits (Section A).
  - Risks and how to deal with them (Section B).
  - The current and future competitive situation and how to prepare for it (Section C).

A. BENEFITS

- The IC offers the potential for significant benefits to both IS users and the corporation. However, there are potential conflicts between IS and users since they will usually not attach the same importance to a particular benefit.
- Some benefits, especially in the productivity area, are amenable to measurement, but only with some difficulty. Unfortunately, the most important benefits from the user standpoint are not easily measured.

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I. BENEFIT CATEGORIES

- The potential benefits from a successful IC are extensive, so extensive in fact that a full listing appears unrealistic. IS management, consequently, should take care to avoid two extremes:

  - IS should not promise, or imply, benefits that it cannot deliver. IC benefits depend on the IC being implemented and supported correctly. An overburdened or undersupported IC will only give mediocre results.

  - On the other hand, IS can go into an IC program with such modest expectations that it is not able to properly exploit the potential benefits, even from an otherwise successful program.

- It is also fair to state that many of the benefits, certainly the extent of benefits from successful ICs, are the result of an effective portfolio of software products, especially fourth generation languages.

  - Experience shows that merely offering a fourth generation language without planning and support produces only marginal benefits to the organization: it is the IC strategy that apparently makes the difference.

  - This issue will become clearer over the next several years as PC versions of fourth generation languages are introduced and users attempt to use them independently.

- Benefits fall into three broad categories:

  - Those which change the systems creation process.

  - Those which improve systems output.

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- Those outside of the systems area, i.e., improvements elsewhere in the organization.

a. Systems Creation Benefits

- The biggest and most obvious change to a data processing professional is that users can build their own systems. Sometimes these may not appear to be "real" systems from the IS professionals' standpoint, since they only result from changing parameters in a ready-made software package.

  - Often, however, they are real systems, programmed in a fourth generation language.

  - The benefit is obvious: users can provide what they want, when they want it. In order to fully exploit this capability to build their own systems, users must often have extensive support from the IC: training, support and sometimes, actual programming assistance.

- Even if users do not independently construct the initial software, they can often maintain it, if they have been sufficiently trained and involved in the initial construction to understand the system's principles.

  - In the long run, this could be the biggest operational benefit to IS, since this would enable IS to partly or wholly withdraw from the maintenance business, a task which most IS departments and staffs dislike.

  - Users may not have any great love of maintenance; however, they are the ones that have the need for it. So, on balance, they view self-maintenance as a desirable change.

- Potentially, the largest change in the systems process is the extent to which the IC/fourth generation language combination allows IS staffs and users to develop prototypes.

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- IS and users can perform such prototype development separately or jointly; or, for example, users can develop prototypes by themselves up to the point where they know what they want and then bring in IS to integrate their needs with other systems and bring the prototype into production.

- Prototyping is somewhat controversial and still not used by most IS departments in any significant way. Some IS departments would not view prototyping capabilities as a benefit.

- Prototyping is a core capability of most fourth generation languages.

b. Systems Output Benefits

- The most dramatic change flowing out of IC operation is the impact on software productivity. Reports of increases of two and three times in lines of code per day are not uncommon; others cite even higher figures.

  - The IC, of course, is the primary IS vehicle for the fourth generation languages for which these claims are made. The RCS companies have been using them for almost 10 years.

  - These productivity gains are often a result of work by both IS and user personnel, so it is difficult in many cases to assess them.

- Implementation directly by users can certainly speed up the process: with only some exaggeration, users say that they can now get out new reports in "minutes, not months." This, of course, assumes that:

  - The user is proficient in the right software tools.

  - The programming task is easy or there is an available template.

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- The required data is already available on the IC system.

- No mistakes are made.

- However, even with these caveats, the reduction in elapsed time that results in direct user interaction with the system is impressive: it is the same rationale that has propelled the PC forward as seen in Exhibit IV-1, and that RCS users have employed for years.

- Under the proper circumstances this end-user-directed programming can also reduce the programming backlog.

  - As noted earlier, however, the IC strategy must take care that it addresses the visible part of the backlog.

  - Some IC managers note that most of their IC users end up dealing with the invisible backlog. This is not surprising since some IS managers estimate that the backlog is like an iceberg - 90% is not "officially" there.

  - While whittling away at the invisible backlog may be quite valuable and productive, it is a fact of life that the official backlog can be, at the least, politically embarrassing. Hence, where IS is concerned about backlogs, the IS strategy should view the identified backlog as its chief target.

c. General Organization Improvements

- One of the biggest benefits from the user's standpoint is a completely intangible one: control. Rather than having priorities and approaches decided by IS, users can often take things into their own hands. Again, this is one of the driving forces in PC and RCS use.

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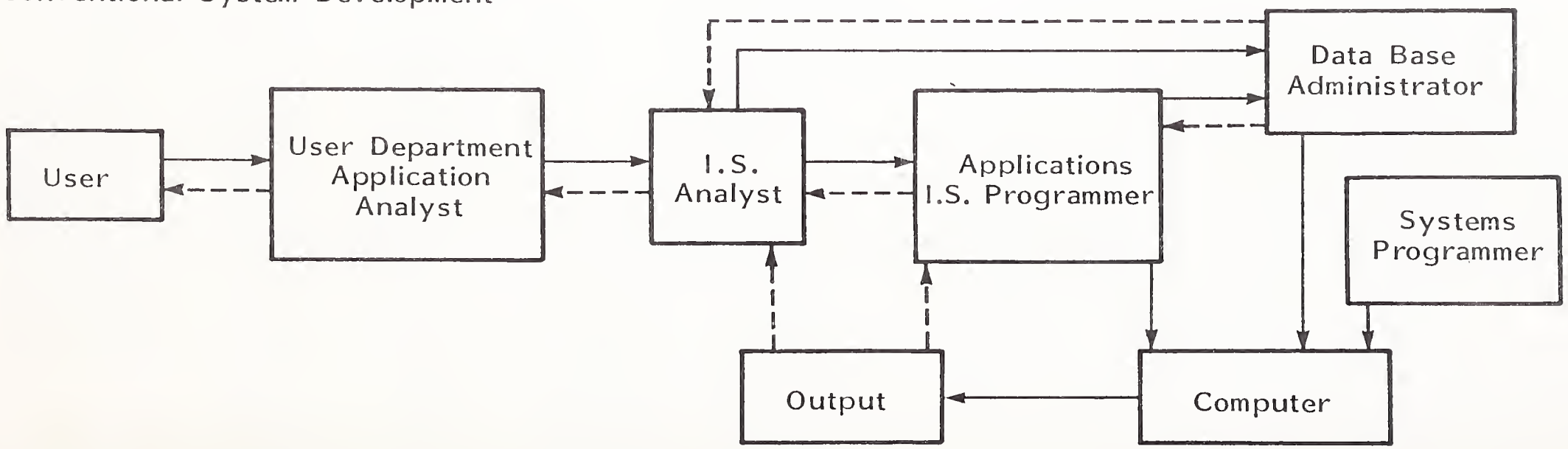
EXHIBIT IV-1

CONVENTIONAL SYSTEM DEVELOPMENT CONTRASTED WITH END-USER DEVELOPMENT

PC/IC System Development

Conventional System Development



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- Slightly more tangible is the user belief that direct interaction with data will lead to better decision making. This is probably a byproduct of the business school emphasis on quantification and analysis.

- Certainly, there can be faster and more extensive access to data, especially corporate data. As noted earlier, the ability to access and integrate corporate data is what can set the IC apart from IC alternatives.

- Some users will go further and state that the IC produces greater organizational productivity. Similar claims are made for PCs. IS would be well-advised not to take sides in these claims, since real organizational productivity springs from many sources.

- A much more tangible benefit is the ability to use the IC as a communications medium via an electronic mail system (EMS). Some studies have shown that a pervasive EMS can add one-half hour a week to an executive's productive time. (Other studies, however, have been less conclusive.)

  - The benefits appear to be dependent on both the critical mass of use in the organization as well as the EMS' functionality and ease of use.

  - EMS success is also linked to the geographic spread of users: they should be neither too close, nor too far away.

2. IMPORTANCE OF BENEFITS

- All of the benefits described in the proceding section are of at least moderate importance to some part of the organization.

  - However, there are tensions which can exist between IS and users: often they do not place the same value on a particular benefit.

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- Exhibit IV-2 shows INPUT's assessment of benefits as perceived by IS and user departments.

- Generally, IS focuses on the technical benefits, as might be expected.

  - Correctly, it does not have strong views on the issues of overall organizational productivity and decision making.

  - Many IS departments have distinctly ambivalent views on end-user control and direct-user access to corporate information. Here they are in potential direct conflict with user views.

  - It should also be noted that end users have no particular interest in increased software productivity, per se. They care about results and when they will get them.

- IS should not change its own priorities nor expect the users to change theirs. There are two lessons which IS should draw from this:

  - Be aware of the divergence in needs and build this awareness into IS plans.

  - Treat IC users as customers; their perception should be that their needs have top priority. This should be made very explicit for the user contact staff.

    - Demonstrations, brochures and training should have a user needs/results orientation, not just a technical slant.

    - If the consulting approach is included in the IC program, the consultants selected should be those who can understand and deal with the user's view of the world.

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EXHIBIT IV-2

INFORMATION CENTER BENEFITS-
INFORMATION SYSTEMS AND USER VIEWS

	IMPORTANCE OF BENEFIT, AS PERCEIVED BY:	
	IS	USERS
User-maintained Systems	High	Medium
Reduced Backlog	High	High
Increased Software Productivity	High	Low
Faster Implementation	Medium-High	Very High
User-built Systems	Medium	Medium
Easier Prototyping	Medium	Medium
Higher Quality Software	Medium	Medium
Intra-firm Communications	Medium	Medium-High
Organizational Productivity	Medium-Low	High
Better Decisionmaking	Medium-Low	High
Access to Information	Low	High
User Control	Low	High

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3. MEASURING BENEFITS

- Substantial parts of the benefits of IC use are potentially quantifiable and measurable. Exhibit IV-3 shows the continuum of benefits from the standpoint of their potential quantification. Many of these benefits can be quite striking, especially those which are the result of new approaches to system and program construction.

- While many of the benefits are measurable, at least to a degree, such measurements are rarely undertaken.

  - Partly this is due to the general rarity of such measurements, primarily because of the difficulty of measuring software productivity factors as seen in Exhibit IV-4.

  - Aside from the practical problems, such measurements only add to activity overheads and do not directly assist the work at hand. There are also considerable fears (often justified) that such measurements will work against the "measurers," that is, the process may document inefficiency or dissatisfaction.

  - In the case of IC functions, there are additional problems:

    . Users are widely dispersed organizationally and, often, geographically.

    . Many adjustments in the measurement protocols would have to be made to take into account differing skill levels, applications and software being used.

    . It is also doubtful if many users would cooperate for any period of time.

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EXHIBIT IV-3

MEASURABILITY OF INFORMATION CENTER BENEFITS

BENEFIT	RELATIVE QUANTIFICATION OF BENEFITS POSSIBLE
• Faster Implementation • Software Productivity • Backlog Reduction	High
• Easy Prototyping • Intra-firm Communications • User-built Systems • Organizational Productivity • Higher Quality Systems	
• User Maintenance • Better Decision Making • Access to Information • User Control	Low

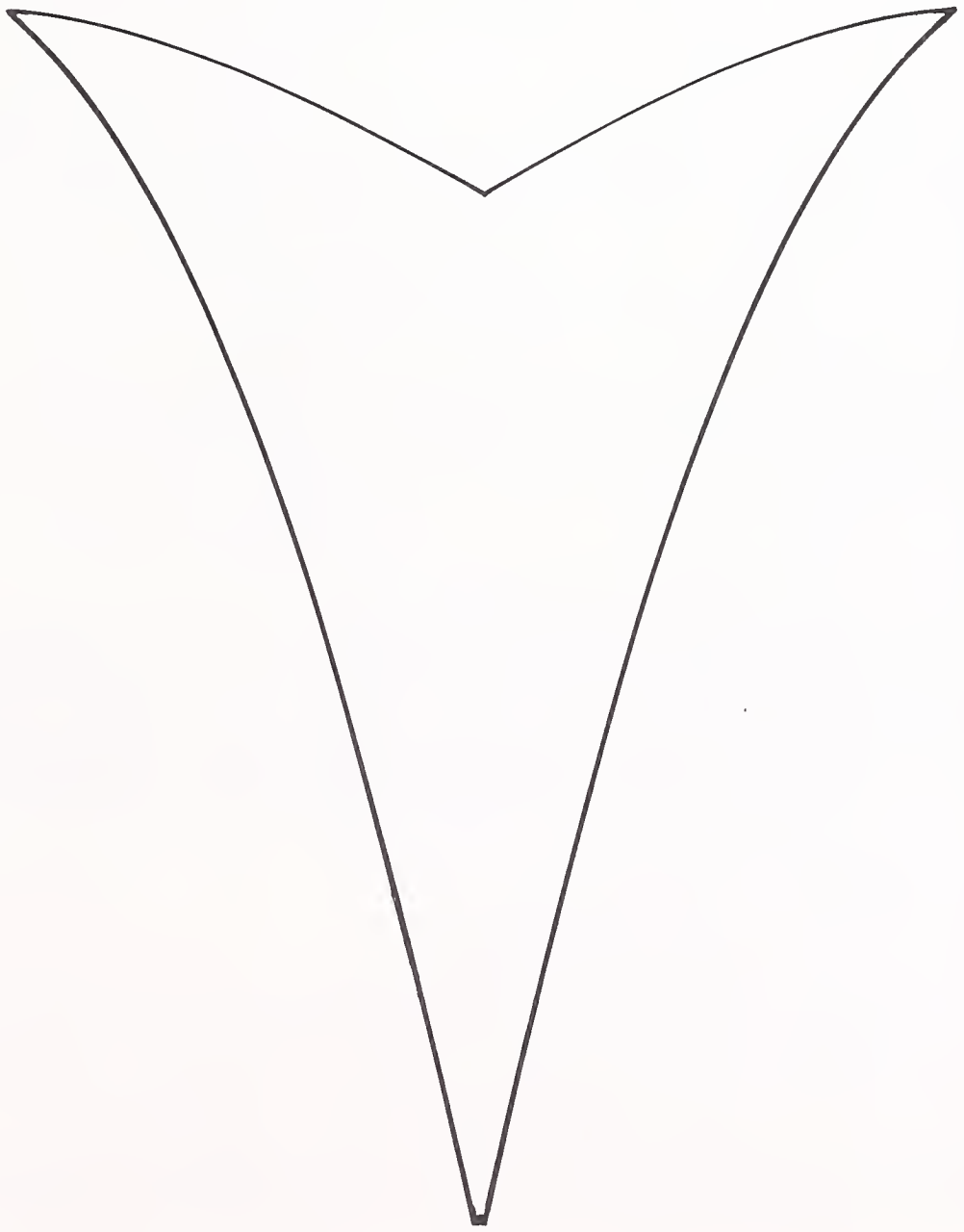

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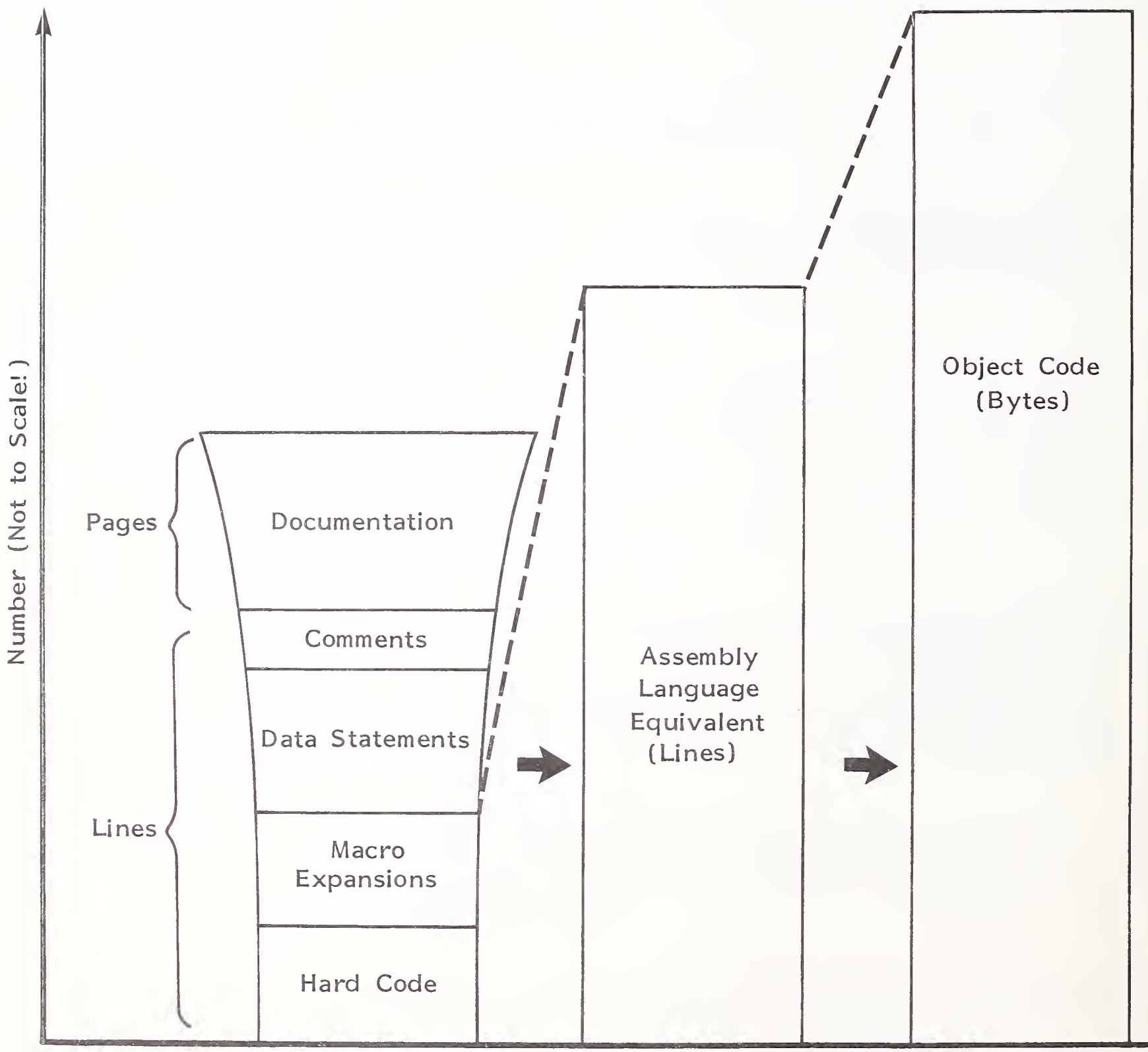
EXHIBIT IV-4

THE SOFTWARE PRODUCTIVITY MEASUREMENT DILEMMA



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- One option is to make periodic, in-depth studies of particular users and applications.

  - Random sampling is the best technique for projecting results over the user population and showing trends with some confidence.

  - The in-depth study is necessary in order to fully understand the usage environment. Automated counting of system statistics will rarely be helpful. This means that samples must necessarily be small.

  - One problem with the sampling approach is that some managers still do not place much confidence in sampling studies, even where well-designed.

- A larger problem involving productivity measurements is that they will often not seem believable by non-IS management. This is likely to be true no matter how impeccable the measurement methodology.

  - Top management has grown used to all subordinate departments making the best case for themselves when describing new ventures, spending plans, improved methodologies, etc.

    . For operating, finance and other principal departments, top management can often apply their own "correction factor" based on personal experience. Where they do not have this sort of hands-on background, they can call on staff specialists to make such evaluations.

    . Top management is usually stymied, though, when it comes to assessing IS proposals. Neither top management nor its staff has this kind of background. Worse still, IS departments have in the past often, intentionally or not, covered their presentations with a technical cloud.

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- For a long time IS was able to coast along because of its overall charisma, helped along, of course, by favorable economic conditions. In most organizations this has now changed: IS is subject to budget ceilings, headcount limits and, even, layoffs.

- As one senior manager put it, "If we had added up all of the personnel savings claimed in data processing proposals that I have approved, there wouldn't be any people left in this company."

- Even if measurement were performed correctly and accepted as such by non-IS management, there is one final insuperable difficulty: areas subject to effective measurement only make up part of the areas that are important to users, as seen in Exhibit IV-5.

4. MANAGEMENT SATISFACTION AS A MEASUREMENT OF SATISFACTION

- In the real world, top management assesses the performance of IS in a very straightforward way: the numbers of complaints received.

  - This can almost be restated as "no news is good news."

  - This means that it is imperative for IS management to have, at the least, some type of early warning system.

- Some IS departments use a direct measurement of accomplishment and have adopted user satisfaction assessments.

  - These can consist of questionnaires, surveys, focus groups, etc. that track satisfaction, dissatisfaction and the reasons for them.

  - These can be very useful devices for keeping track of user feelings and taking appropriate corrective action.

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EXHIBIT IV-5

INFORMATION CENTER BENEFITS: IMPORTANCE VERSUS QUANTIFICATION

IMPORTANCE TO USERS	QUANTIFICATION POSSIBLE		
	HIGH	MEDIUM	LOW
Very High	Faster Implementation		
High	Backlog Reduction	Organizational Productivity	Better Decision Making
			Access to Information
			User Control
		Communication	
Medium		Easy Prototyping	User Maintenance
		User-built Systems	
		Higher Quality Systems	
Low	Software Productivity		

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- However, to the extent that these efforts to measure satisfaction are applied to traditional data processing systems, then satisfaction measurement will give only partial results and will ultimately prove frustrating.

  - By their nature and design, traditional systems are hard to change quickly; sometimes, of course, the problem is embedded within the system design itself and cannot be changed at all until a new version of the system is written.

  - Even where change is possible, such change requests join the multiyear backlog.

- In traditional systems, at best, users tend to feel neutral ("everything's going all right, for now") toward IS. This is literally a no-win position.

  - On the other hand, users can be very happy, in a positive sense, in a well-run IC environment.

  - There is a higher risk of dissatisfaction, though, since IC failures are personal and immediate.

  - Exhibit IV-6 contrasts the ranges of user attitudes possible in the traditional data processing and IC environments.

5. CONCLUSIONS

- Many important IC benefits cannot be measured easily or at all. Some of these immeasurable benefits are of the most importance to users. Even if measurement were possible, they would usually not be accepted by top management.

- The IC should promote senior management approval and satisfaction by:

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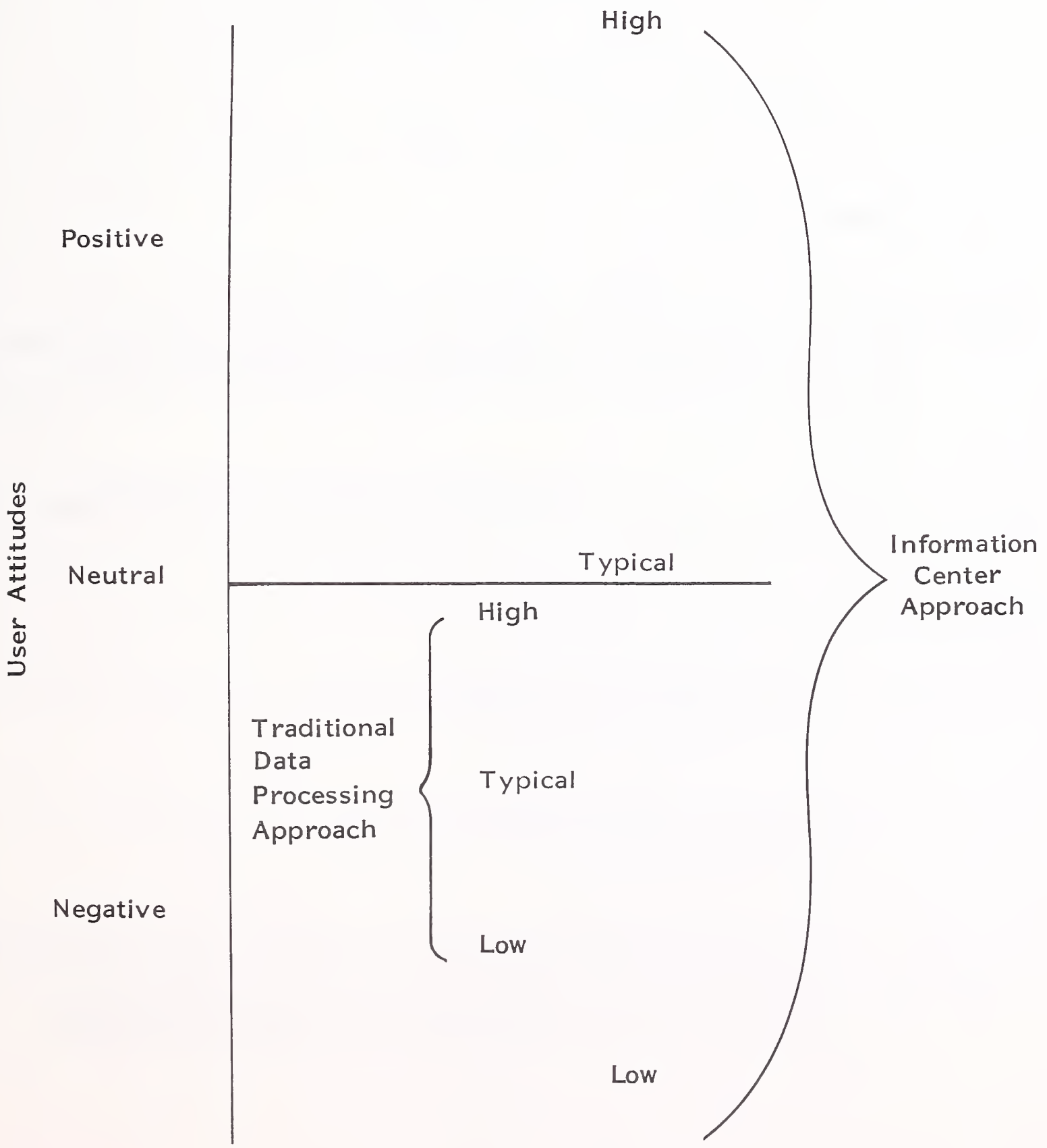
EXHIBIT IV-6

USER ATTITUDES TO TRADITIONAL DATA PROCESSING AND THE INFORMATION CENTER



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- Targeting user needs in general and those of key senior managers in particular.

- Ensuring that the desire and ability to satisfy customer needs is embedded in the IC.

- Effectively marketing the IC to those key areas.

- Delivering on its promises.

B. DOWNSIDE RISKS

- Nothing as potentially revolutionary as the IC is without risks and problems. The chief area of risk has to do with both IS and users finding themselves placed in new roles.

- If the IC were taken to its logical extreme (as has been done in a few organizations), there would be no more applications programmers as we know them now:

  - "Programmers" would work together with users to create systems based on fourth generation languages.

  - The data management tasks of IS would increase greatly as the IS function became one of data "traffic cop."

  - Data and access security would become paramount issues; extensive IC networks would be tempting targets to bright teenagers (see INPUT's November 1982 report, How Much Security Do You Really Need?)

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- Access of another type will also be a paramount issue in successful ICs: how to keep up with user demand, without resorting to the crude controls now used. Such controls would be counterproductive in an IC "business" environment.

- Users, too, will have to adjust to the new environment. Until the users understand that they really are much more responsible for their own destiny than before, they may continue to play political games with IS concerning resources, control, fault-assignment, etc.. IS and IC management must try to help users through the transition period and not fall into the same trap themselves.

- One of the biggest risks is that apparent benefits will ultimately turn out to be detriments as seen in Exhibit IV-7. However, each of the potential detriments can be prevented or alleviated by a well-run IC program.

C. INFORMATION CENTER COMPETITORS

- In spite of the IC's real and potential benefits, it is not operating in a vacuum.

  - RCS firms, while having lost some of their punch, are still formidable competitors.

  - The personal computer may be the most serious competitor in the long run.

- INPUT does not take the position that the IC, or any specific solution is invariably the most suitable alternative. This will depend on the situation. This section analyzes the strengths and weaknesses of each approach.

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EXHIBIT IV-7

INFORMATION CENTER BENEFITS VERSUS DETRIMENTS

BENEFIT	RELATED DETRIMENT	PREVENTION/ CURE OF DETRIMENT
Reduce external RCS costs	Increases IS costs; original benefit subsequently forgotten	Effective IC price mechanism (see Chapter V)
Reduce backlog	May not affect visible backlog; may create new demand	• Effective initial target identification • Ability to handle growth (see Chapter V)
Faster, user-led development	May increase overall demand for conventional systems	• Expand IC capabilities • Ability to handle IC growth
Higher user satisfaction	Users become more demanding, "know it all"	Effective marketing and training
Better organizational productivity and decision making	Backlash against overselling	Effective marketing
User self-maintenance	Users may not be able to support maintenance returned to IS	Effective training and support
User control; access to data	User inefficiency, increased administrative costs	• Effective consulting • Effective training and support

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- Each IC organization should stress to users an open attitude when dealing with alternatives. ICs cannot address all users' computing needs.

I. REMOTE COMPUTING SERVICES (RCS)

- For some time RCS companies have recognized "in-house timesharing" as a potential limitation on their business. However, it was felt to be more of an annoyance than a mortal threat because "in-house timesharing" was essentially reactive:

  - Larger, more visible applications were targets for moving in-house. IS has traditionally been directly aware of only a few of the most lucrative RCS applications in their organization.

  - Usually IS has given mediocre service under these circumstances. This has made the commercial organization look good; in addition many end users are relatively insensitive to RCS costs, since the DP cost component of a project is usually small.

  - Most importantly, IS has not had an overall strategy for attacking the RCS business, but at best was selecting individual targets of opportunity.

- An RCS company will find it more difficult to compete against a well-functioning IC for certain applications:

  - The commercial firm can no longer offer superior service.

  - It will be about even in reducing backlogs, speed and user control.

  - IC pricing should be somewhat (at least 25%) lower since it will have lower marketing costs and does not usually have the option of making a profit.

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- The IC will have an advantage in access to corporate data; IS departments will exploit this most significant advantage.

- Increasingly, RCS firms are offering their system-building expertise in combination with long-term processing contracts.

  - Some users are buying RCS, essentially to obtain a system that is otherwise caught in the IS backlog.

  - Again, IS would be wise to offer the consulting option to assist users in building systems.

  - If IS personnel are scarce, IS can serve as a prime contractor or other form of intermediary by offering programmer-consultants, or RCS firms.

- RCS firms will probably always have an advantage over IC staff in straight selling skills, including problem analysis and solution determination.

- Increasingly, though, RCS companies have turned their attention to what they now perceive to be the real threat and opportunity: personal computers. They are taking four approaches:

  - Offering PC-like functions on their own system (with mixed success).

  - Offering DDP-like services, with the PC on one end.

  - Selling PCs themselves.

  - Selling PC software.

- IS managers are more than confident of their ability to compete with RCS through ICs, as shown in Exhibit IV-8.

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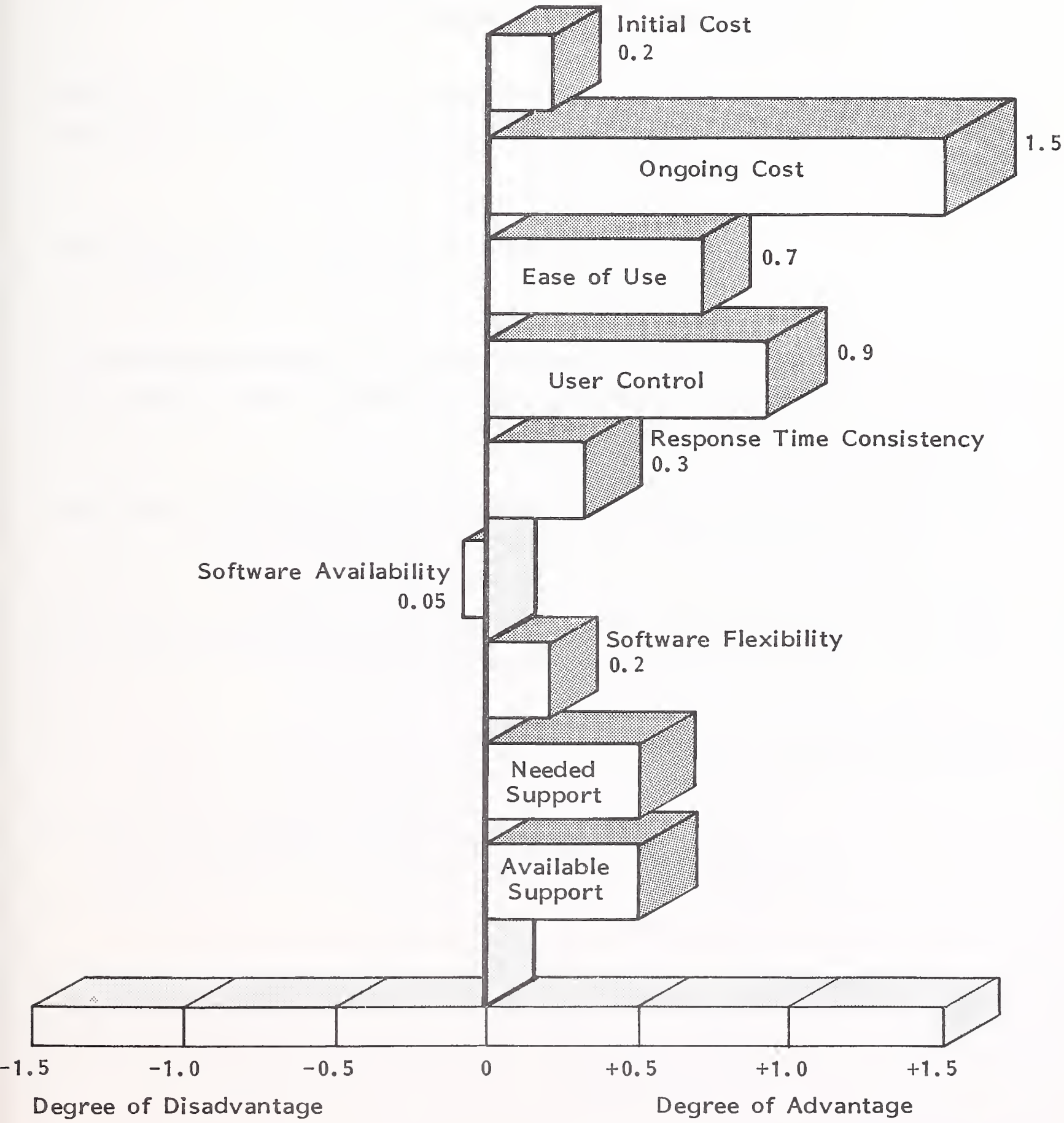
EXHIBIT IV-8

THE INFORMATION CENTER COMPARED TO RCS



(2.0 = Maximum Advantage or Disadvantage)

SOURCE: INPUT Survey of IS/IC Managers

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- Ongoing costs are seen, correctly, as an advantage, although not perhaps as big as IC personnel believe. There is a tendency in IS departments to compare IS computer operations costs against the RCS companies prices. This overlooks two things:

  . The RCS company prices used for comparison are their published prices - these are often discounted, especially for major applications.

  . Internal IS timesharing operations have historically provided a low level of support.

- In other areas IS management is overestimating its capabilities: a superior IC after all should aspire to being no better run than a successful RCS company.

- In INPUT's view, a well-run IC can have some advantages over an RCS company in certain situations. These advantages include:

  - Most importantly, a tie-in to corporate data. This may be offset by IS's lack of familiarity with external data bases.

  - ICs can have cost advantages.

    . Their customers are semi-captive, therefore sales costs are lower (sales costs can be 25% higher for an RCS company).

    . Profitability is usually not an issue.

    . On the other hand, RCS companies often have less expensive hardware and smaller administrative payrolls than their Fortune 500 IC equivalent.

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- A less tangible advantage with users is that an IC is not always trying to sell something.

  . Historically, of course, IS departments have had the opposite problem: avoiding work because of backlogs.

  . If the IC adopts the consulting approach, then it can provide an even wider range of objective analysis, assessing the advantages for a user between the IC, PCs traditional data processing, and RCS.

2. PERSONAL COMPUTERS

- As noted above, RCS companies see the PC as their main rival now. This is echoed in the views of IS managers, as shown in Exhibit IV-9.

  - They are far less positive in their assessment of the competitiveness between the IC and the PC than they were in relationship to RCS.

  - This may be too gloomy a view since the IC still has advantages (discussed in the following section) and could in fact be the focal point for PC networks of the future (see Chapter V).

- There is little question though that there will be a battleground between centralized and decentralized solutions in the next few years.

  - PCs are becoming much more powerful and inexpensive.

  - PCs are "in" now.

  - Much powerful mainframe software is being adopted to the new generation of PCs. This will give PCs much (although not all) of the functionality of the IC, as shown in Exhibit IV-10.

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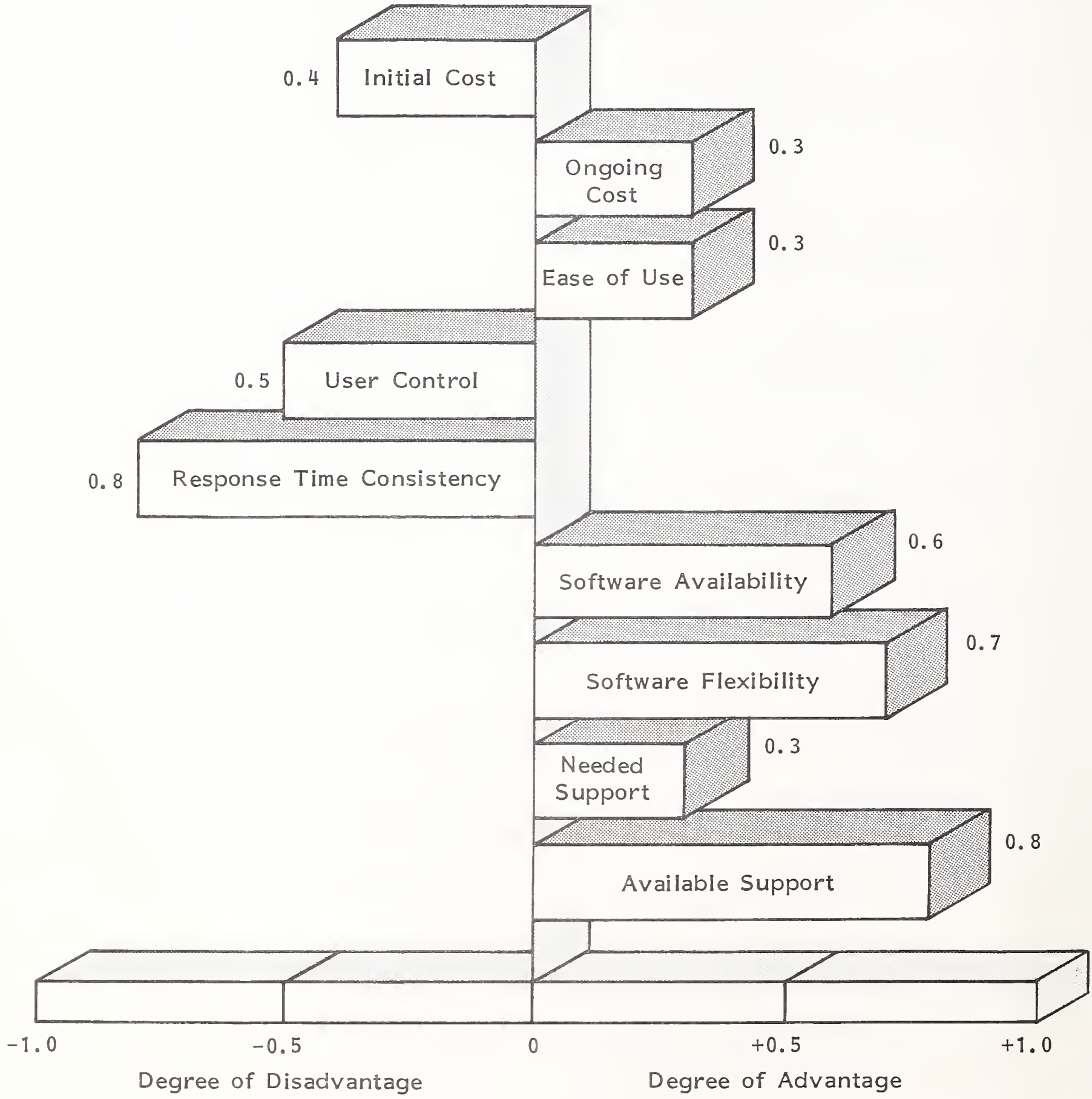
EXHIBIT IV-9

THE INFORMATION CENTER COMPARED TO PERSONAL COMPUTERS



(2.0 = Maximum Advantage or Disadvantage)

SOURCE: INPUT Survey of IS/IC Managers

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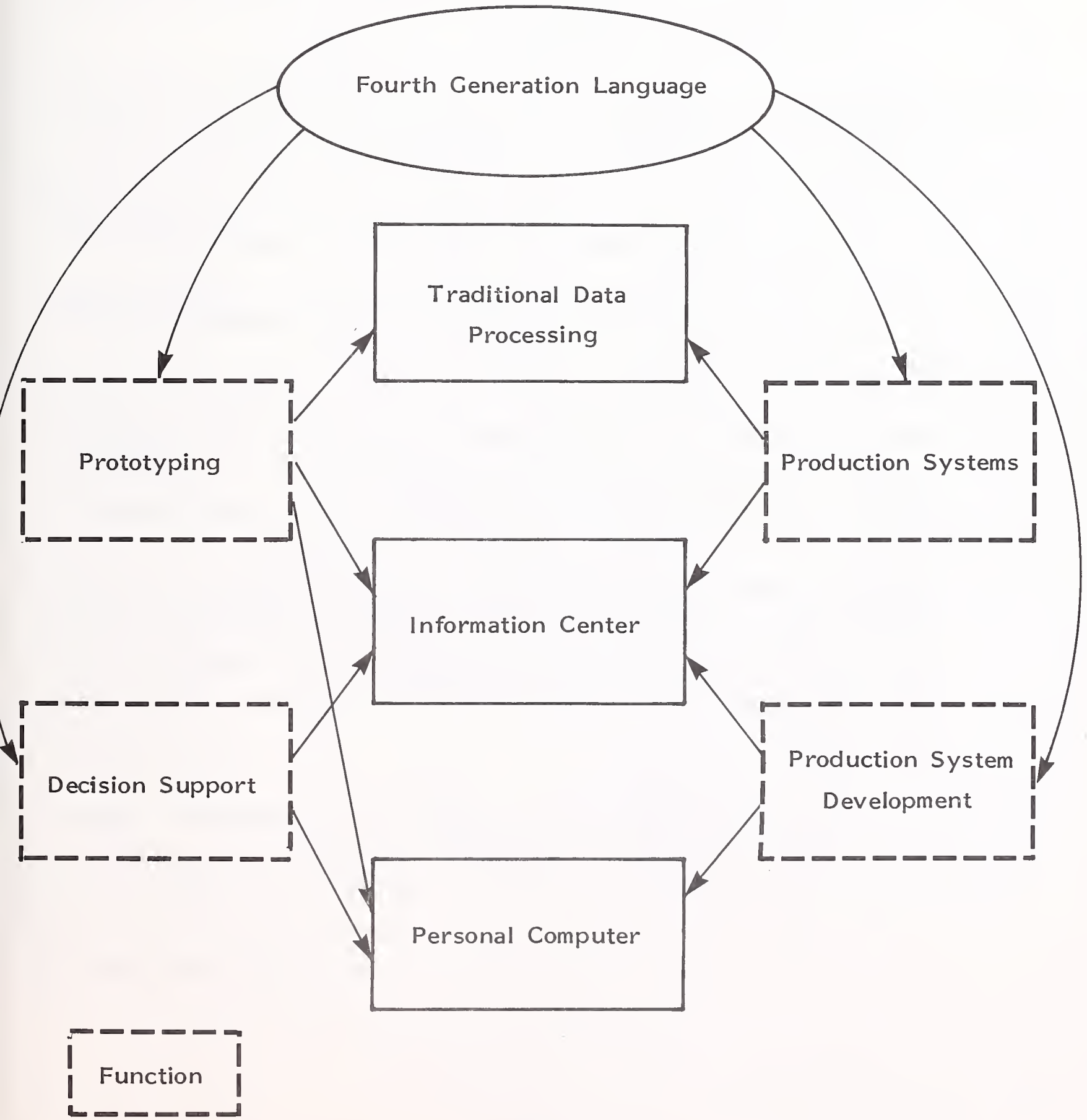
EXHIBIT IV-10

FOURTH GENERATION LANGUAGE FUNCTIONS
AND THEIR PRODUCTION LOCUS



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- IS planning in general should be addressing this set of issues now to avoid being blind-sided as so many IS departments were when PCs were initially introduced.

3. THE COMING CLASH

- As PCs mature they will become even more attractive alternatives than they are now as Exhibit IV-11 illustrates.

- One bright spot is that with the emerging dominance of IBM in the PC world, IS departments can have some assurance that PC-mainframe solutions will not be forgotten.

  - However, even IBM cannot guide markets where they do not wish to go.

  - Also, because of IBM's organization, PC-mainframe solutions do not have high priority.

- From a strictly functional standpoint the IC can offer at least as many options as the PC and sometimes more, as shown in Exhibit IV-12. The tradeoffs are more complex when comparing IC functions with traditional data processing.

- The biggest problem facing IS and the IC is that in the medium term, ICs are likely to find that what are now two separate alternatives (PCs and RCS) can be merged into one: RCS companies are actively selling PC-based solutions. They will use their selling skills to offer solutions that are tailored to the user's needs.

  - This heightens the longer-term need for IS to develop the internal consulting capability to provide users the same types of alternatives.

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EXHIBIT IV-11

CHARACTERISTICS OF COMPUTING ALTERNATIVES FROM THE USER'S VIEWPOINT

CHARACTERISTIC	COMPUTING ALTERNATIVES		
	PERSONAL COMPUTER	REMOTE COMPUTING SERVICES	IN-HOUSE TIMESHARING/ INFORMATION CENTER
Initial Entry Cost (For a Department)	Low	Very Low	Very Low
Operating Costs (For a Department)	Very Low	High*	Medium
Corporatewide Costs	Medium to High	High*	High*
Demands on User Personnel	Medium to High	Low to Medium	Medium
User Control	High*	Medium to High	Medium
Application Flexibility	Medium to High	Medium to High	Medium
Features Available	Medium to High	High	Medium
Response Time Consistency	High*	High*	Medium*
Application Implementation - Speed	High*	High*	Low to Medium
- Cost	Low to Medium	High*	Medium to High
- Ease of Use	Medium to High	High	Low to Medium*

* Key Factors Determining Acceptance

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EXHIBIT IV-12

IMPLEMENTATION OPTIONS: PROFILES

FACTOR	IMPLEMENTATION OPTION		
	PERSONAL COMPUTER	INFORMATION CENTER	TRADITIONAL DATA PROCESSING
User Involvement	High	High	Low
Processing Power	Low	High	High
Flexibility	High	High	Low
Complex Data Management	Low	Medium	High
Large Data Storage Needs	Low	Medium	High
On-line Orientation	High	High	Medium
Transaction Orientation	Low	Low	High
Generalized Suit-tability Package	High	High	Low

Note: "High, Medium, Low" refer to how well a particular option is suited to each factor.

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- Also, this consulting capability can assist the users in choosing objectively among the alternatives.

- In this regard IS managers should remember that organizational units often become captives of their constituencies. In other words, IC staff will almost always end-up with an end-user's view as opposed to an IS view of the alternatives.

- IS should regard the computing options of IC, PC, and RCS as being complementary and coexistent rather than competitive. Battles fought in this arena can only be lost by IS: IS should stay above any conflicts.

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V INFORMATION CENTER STRATEGIC ISSUES

V INFORMATION CENTER STRATEGIC ISSUES

- This chapter analyzes two important IC issues:

  - The implications of IC growth on planning, with pricing as a critical controlling agent.

  - The future directions of the IC, especially the stages of IC development beyond the current one.

A. CONTROLLING AND GUIDING GROWTH

1. GROWTH AND ITS IMPLICATIONS

- The growth rate in ICs is expected to be high in the near term. Among those that INPUT surveyed, growth in terms of both the number of IC users and number of IC terminals is expected to be quite high from 1983 to 1985.

  - The number of users is expected to increase by about 400% in that period as shown in Exhibit V-1. The clerical use is expected to have the highest increase, probably reflecting a current small base and expectations that some work can be downloaded from professional to clerical staff.

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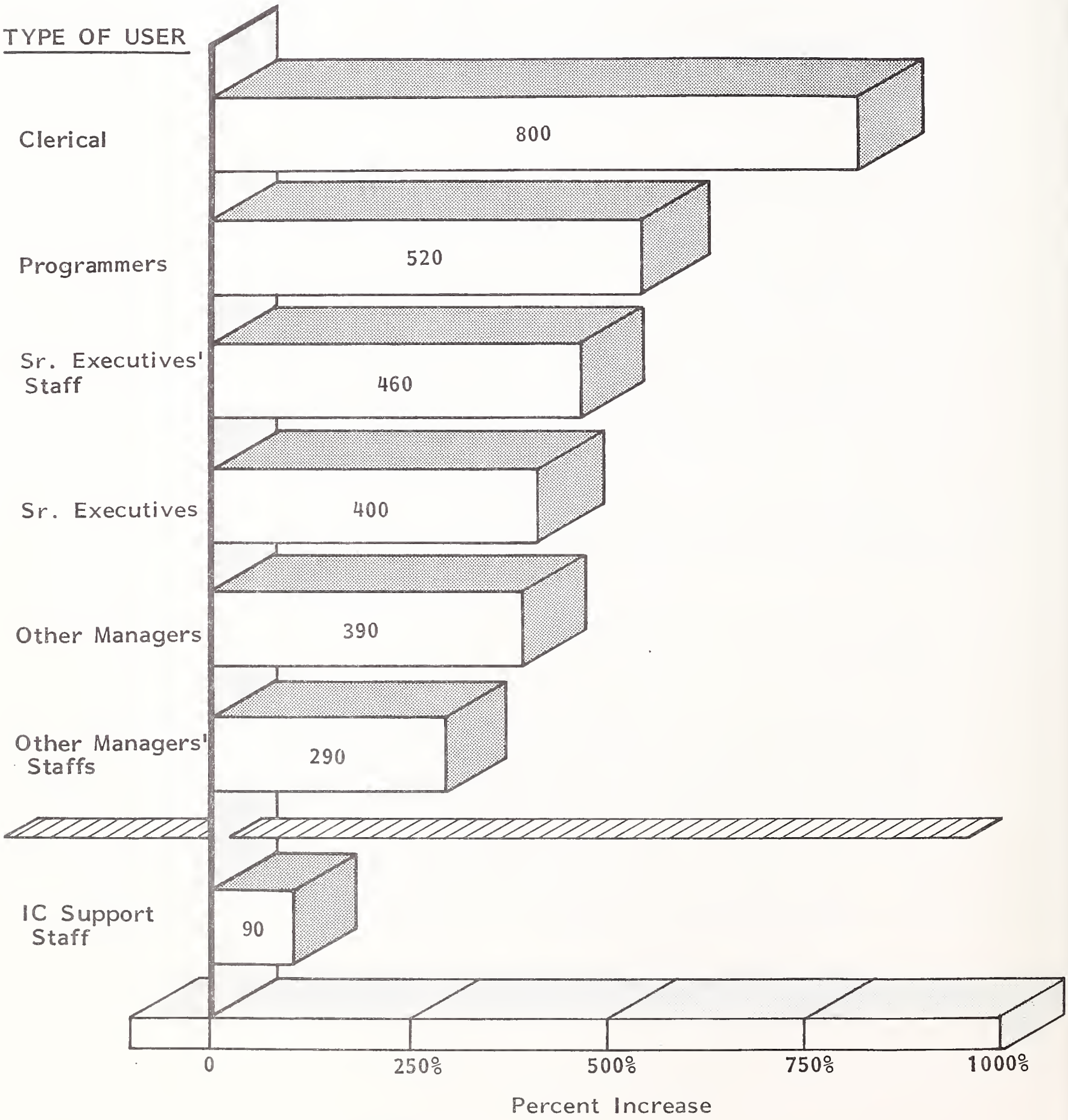
EXHIBIT V-1

NUMBER OF INFORMATION CENTER USERS, BY TYPE OF USER, 1983 - 1985



SOURCE: INPUT Survey of IS/IC Managers

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- Terminals used for IC purposes will grow at about the same rate as Exhibit V-2 illustrates. Growth is therefore expected to occur largely due to an increase in terminals and not in the number of people per IC terminal.

  . Terminals shared with other functions are expected to predominate.

  . By far the largest growth is expected in PCs tied to the IC. Despite PCs present infinitesimal base, their strong growth is indicative of the rising importance of PC's in the IC.

- IC support staff is projected to grow much more slowly than other parameters. This should be a real warning flag: most of these ICs will not be able to give adequate support to their users; they will not fulfill expectations, nor will they reap many of the potential benefits from the IC.

- Unfortunately, this represents a realistic appraisal of what personnel resources are likely to be available and what the likely demand is for a "real" IC.

  - In a sense, many IS departments are captives of their own success in having brought RCS in-house on a cost-avoidance basis.

  - By having convinced management that equivalent in-house costs to replace RCS were 35%-50% of current charges, they were condemning themselves to offering a second class service.

  - The rest of the corporation may have to be reeducated into accepting that 60-70% of RCS prices (not price lists!) is a realistic goal for a quality service. Otherwise, an adequate service level cannot be supported.

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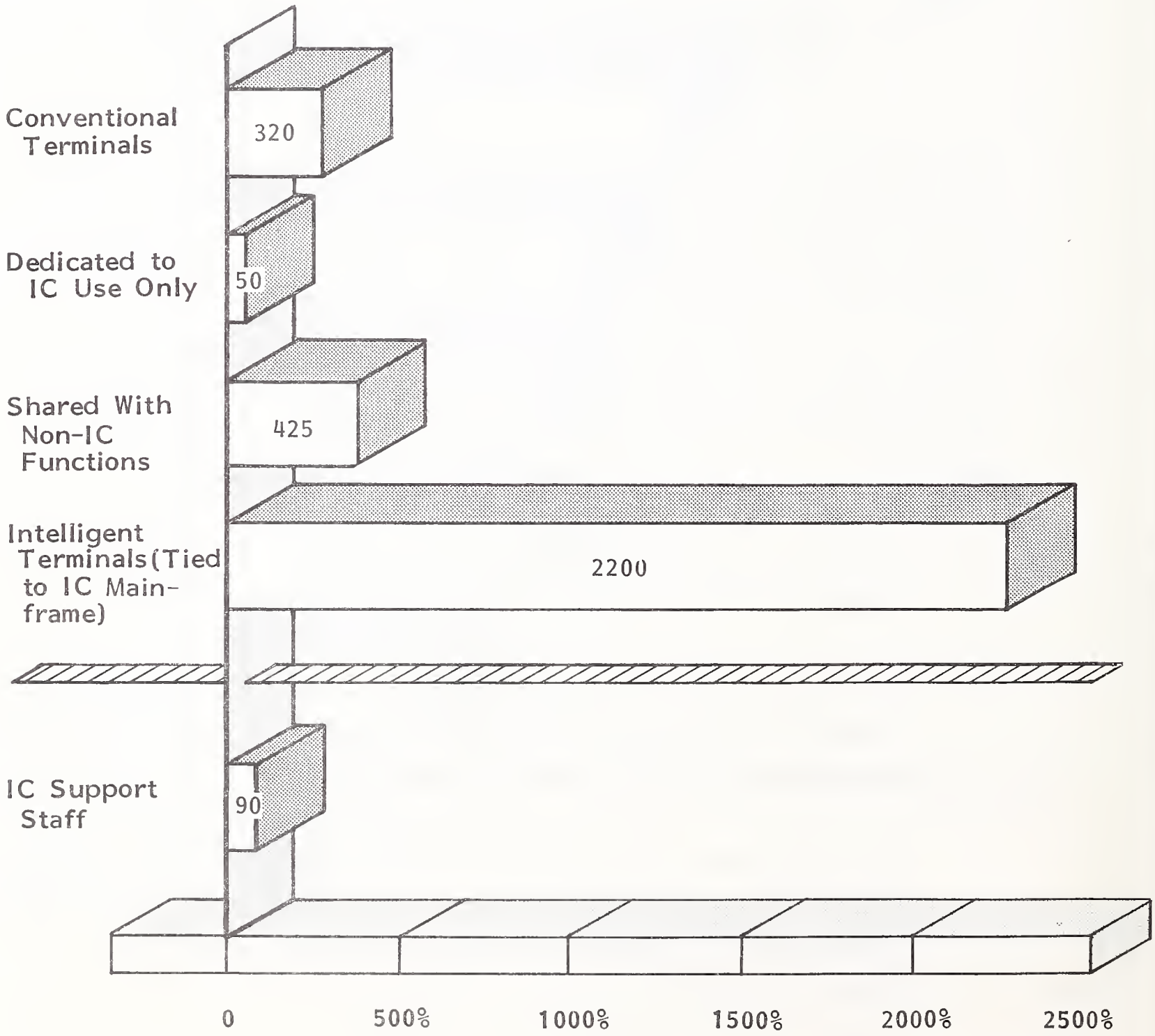
EXHIBIT V-2

INFORMATION CENTER TERMINALS, BY TYPE OF TERMINAL, 1983 - 1985



SOURCE: INPUT Survey of IS/IC Managers

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- IC growth will also mean many more computing hardware resources will be required than were expected because of inefficiency and intensity of hardware use, as shown in Exhibit V-3.

2. PLANNING FOR GROWTH

- The biggest middle-term planning issue facing ICs is how to plan for growth. There are two choices:

  - Putting limits on growth so that demand does not outstrip supply.

  - Obtaining enough resources to at least keep up with user demands and, ideally, anticipate them.

a. Limiting Growth

- Limiting growth is inherently unattractive, since by doing so potential users are denied the benefits of the IC. They will turn to other, often less satisfactory means of filling their needs.

- There are four ways to limit growth:

  - Placing a ceiling on the numbers of users and/or terminals.

    . This does not deal with increases in use intensity directly.

    . More importantly, impatient users will start to "borrow" terminals and passwords.

  - Limiting training. This is self-defeating since it just increases unskilled use, thereby increasing demands on IC support.

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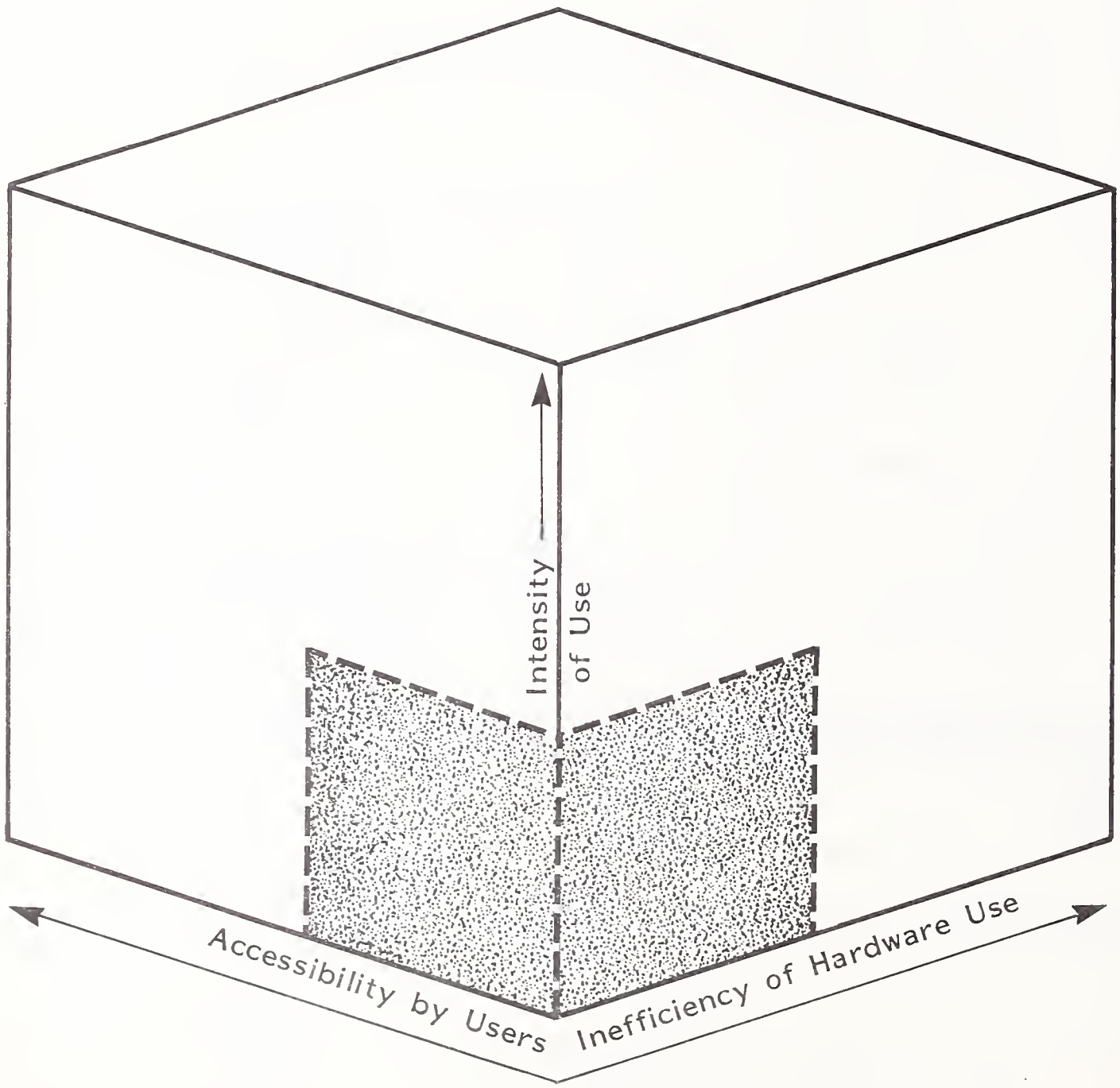
EXHIBIT V-3

COMPUTING RESOURCE USE:
TRADITIONAL COMPUTING ENVIRONMENT VERSUS INFORMATION CENTERS



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- Allowing service to deteriorate, e.g., increase response time, providing insufficient training and support. This is extremely counterproductive because it discourages long run use of the IC.

- Adjusting pricing.

  . This is a very attractive method in organizations which use at least "semi-real" money for chargebacks.

  . Because of its larger implications, the next section is devoted to pricing.

b. Pricing

- While pricing can be used to limit use of the IC, a much more positive use of pricing is to have the IC become self-financing. In addition there are a number of other reasons for instituting pricing, such as:

  - Collecting information.

  - Allocating costs.

  - Directing the use of the IC into particular areas.

- Exhibit V-4 shows how these reasons often have a different level of importance to IS and to user departments. Therefore, it is important to present pricing issues in a way that will be most effective with users and top management.

- A good IC pricing mechanism should have the following characteristics:

  - It should be widely perceived as being fair. Variations should be seen to support reasonable objectives (e.g., discounts for off-peak service).

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EXHIBIT V-4

REASONS FOR CHARGING FOR INFORMATION CENTER USE - IS AND USER VIEWPOINTS

REASONS FOR CHARGING	DEGREE OF IMPORTANCE TO:	
	IS	USERS
Collection of standardized use statistics	High	Low
Feedback of information to user management	Medium	High
Feedback of information to top management	High	Low
Payment for resources used	High	Medium
Allocating costs reasonably		
• Between departments	Medium	High
• Between IC functions provided	High	Medium
Discipline the use of the IC	High	Low
Spread peak loads	High	Low
Limit IC use	High	High

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- There should be a reasonable relationship to actual services received and costs incurred (although not a slavish one).

- Price levels should be reasonably close to those of alternative sources, preferably somewhat lower.

- As noted, the dollars involved should be at least "semi-real," i.e., included in the administrative budget, even if not transferable to outside sources.

  - It would often be preferable from a business standpoint if these were "real" dollars, i.e., those that could be spent on outside competitive services.

  - This is, however, a controversial concept and is not followed by most organizations (see INPUT's 1982 study, Evaluating the EDP Level of Service). For IS departments with bad reputations, it could be a disaster to implement such a policy prematurely.

- The major areas of IC service that should have their costs covered are:

  - Data processing services.

  - Training.

  - Hotline support.

  - Consulting.

  - Technical support.

- For most of these, it is fairly easy to link the costs with the services received, and the costs vary according to external variables (generally use and number of users, as shown in Exhibit V-5).

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EXHIBIT V-5

PRICING FACTORS BY TYPE OF INFORMATION CENTER SERVICE

TYPE OF IC SERVICE	EASE OF IDENTIFYING SERVICE RECEIVED	MAJOR CASES OF COST VARIATION
Data Processing	High	1. Usage Levels 2. Number of Users
Training	High	1. Number of Users 2. Number of Departments (Tailored Courses/Sections)
Hot Line	Medium	1. Number of Users
Consulting		
• Identifying Computing Alternatives	High	Varies
• Programming	High	Type of Work
Technical Support	Low	1. Amount of Software 2. Amount of Usage

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- Since technical support is difficult to attribute to a particular user, it should properly be included as a cost item within data processing services. Otherwise costs should be billed to users.

- However, it is not necessary to have a completely itemized billing approach. For example, a flat rate can be assessed for each department using the IC and another flat rate for each person.

  - The department charge covers special services for that department, such as course and support customizing, computer alternatives consulting, etc. (Programming would be billed on a per diem basis.)

  - The user charge would be for all hotline costs as well as for half of expected training costs. The remaining training costs would be billed on a per course basis.

- The largest number of charges will come from data processing services. Here is one area where it would be unwise to follow the example of timesharing firms too closely. They use algorithms which are complex and difficult to understand.

  - Since their customers' workload characteristics vary greatly, they cannot tailor their pricing approach for individual customers.

  - They do not want their individual or corporate customers to be able to calculate their workload's charges in advance. This would make price comparison shopping too easy.

- Neither one of these arguments applies to an IC. Consequently, it would be to the interest of both IS and its customers to come up with easily understood surrogates for classic RCS technical measures (CPU units, EXCPs, etc.).

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- For example, in much of business, data processing rates, based on the amounts of data used and stored and reports prepared, would produce reasonable charges.

  . Some reports, it is true, take more computer resources than others. However, most users would trade pricing clarity and predictability for strict accuracy.

  . Special services, such as multiple copies, graphics output, could be charged for on a similar output unit basis.

- Certain pieces of software (scientific calculation, complex models, etc.) would be charged for on a different basis. Again, the pricing should be in user terms, not technical terms.

- The system would have to be fine-tuned, after a period of testing, to identify and deal with extreme anomalies.

• One of the chief advantages of a user-oriented billing approach (other than overall user satisfaction, of course) is that billing-based incentives can be more effective.

- One of the goals of the IC should be to reduce "peaks and shoulders" in IC use, as Exhibit V-6 illustrates.

- Shoulder prices could be reduced to a certain percent of normal prime shift prices. A discount has more meaning if it is 50% of $100, than 50% of X.

- Non-prime usage should be a very small percent of prime shift. Free periods have strong attractions (as an employee benefit, if nothing else). Free periods can transfer computing being performed for personal reasons out of prime time.

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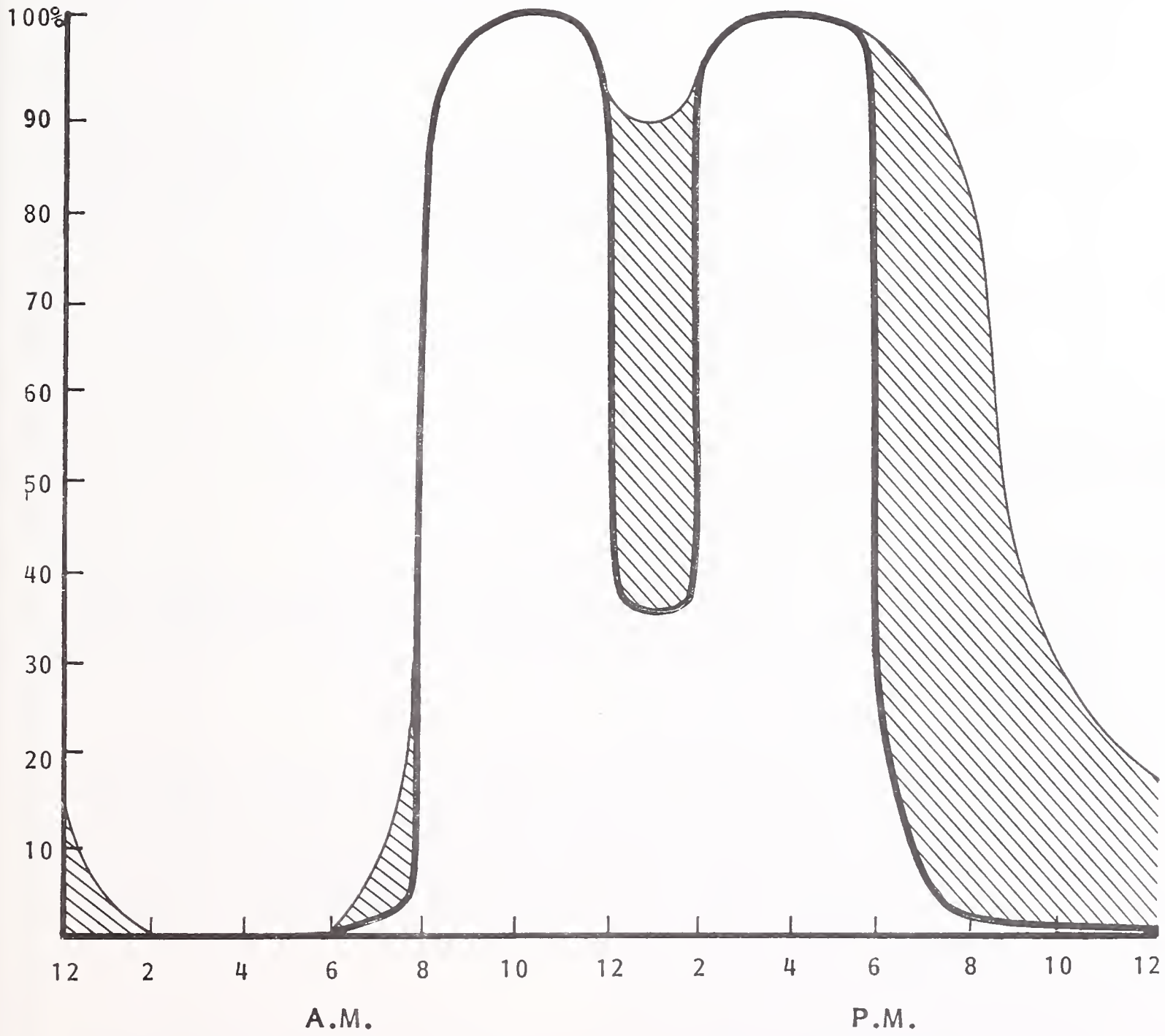
EXHIBIT V-6

PRICING TO FILL SHOULDER PERIODS



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- If the corporation's administrative procedures allow it, the pricing mechanism can be used to keep the IC self-sustaining.

  - This can be greatly assisted where departments can be given modest discounts for signing agreements that specify their incremental rate of use.

  - Such an agreement can then be used to justify acquiring more hardware and personnel resources.

    . In many organizations, the financial controllers will not allow IS investments merely on the basis of increased projections of use, even where it is reasonable to expect they will occur.

    . A signed contract is something they can understand, however.

B. FUTURE DIRECTIONS

- A service-oriented IC is a decided advantage over "in-house timesharing," however, there are at least two more levels, shown in Exhibit V-7, that the IC could progress to:

  - The Information Center II would integrate PCs and prototyping (design languages). Support would become much more efficient, using computer-based training and extensive help facilities built into the IC software. Current standalone or clustered O/S functions would also be integrated.

  - The Information Center III is far more speculative and would integrate much more intelligence into the system. Voice input and output could

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EXHIBIT V-7

STAGES OF THE INFORMATION CENTER

STAGE	DESCRIPTION	CHARACTERISTICS
0	In-house Timesharing	• Pulling in of Jobs on commerical timesharing • No software "portfolio" • Suboptional training and support
1	Information Center I: Service	• Software portfolio • Adequate, but expensive, training and support • Application consulting
2	Information Center II: Integration	• Integrated computer based training • Semi-automated support • Integrated prototyping/design language • PC's mainframes integrated • More mainline systems • Text and other office systems functions
3	Information Center III: Intelligence	• Voice input • Voice output • Computable graphics design tools • Artifical intelligence systems

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be realistic tools. Graphics design tools that translate into computer code would directly support user interaction with the IC.

- Exhibit V-8, V-9, and V-10 show the network implications of these stages.

- The reason that the future of the IC is important is to show the potential that the IC has in removing the roadblocks that face conventional data processing.

  - Conventional data processing has grown much bigger since the introduction of the first IBM System/360, but not a great deal better. It is still caught in a vicious circle of rigid specifications, incomplete analysis and faulty, expensive software, as shown in Exhibit V-11.

  - The IC can be the vehicle for moving IS and users out of this circle into, potentially, the virtuous loop shown in Exhibit V-12.

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EXHIBIT V-8

INFORMATION CENTER I

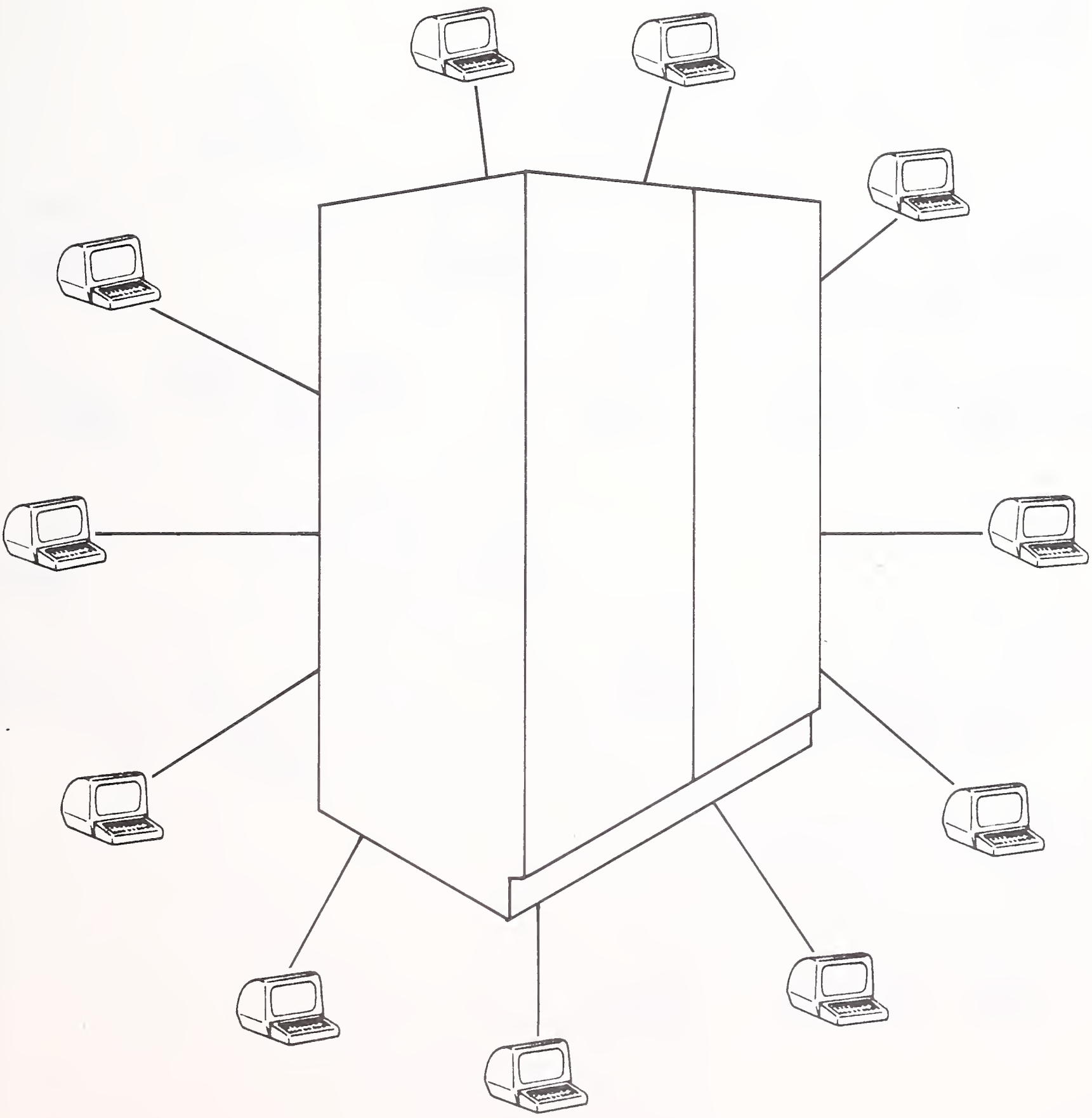

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EXHIBIT V-9

INFORMATION CENTER II

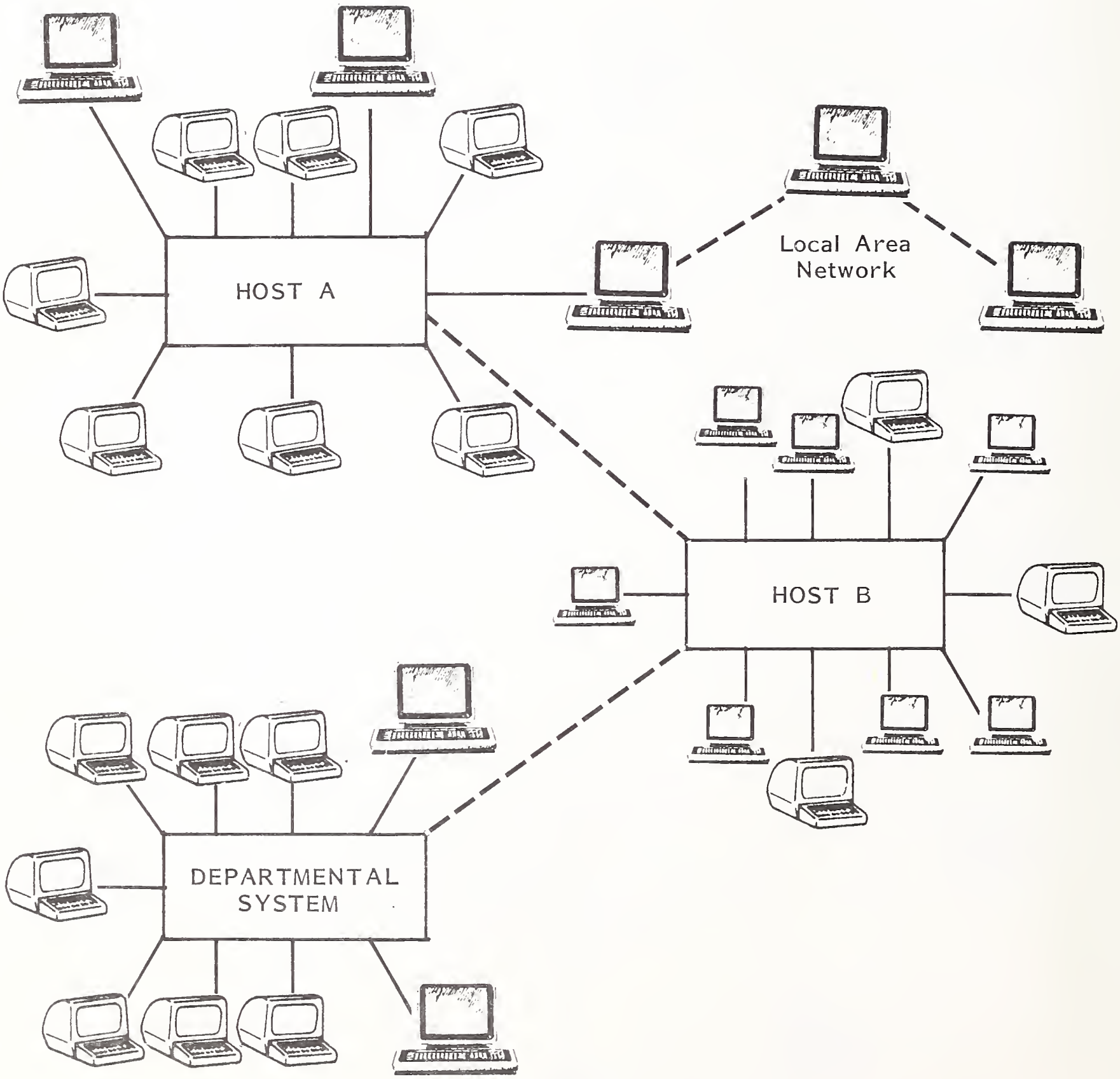

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EXHIBIT V-10

INFORMATION CENTER III

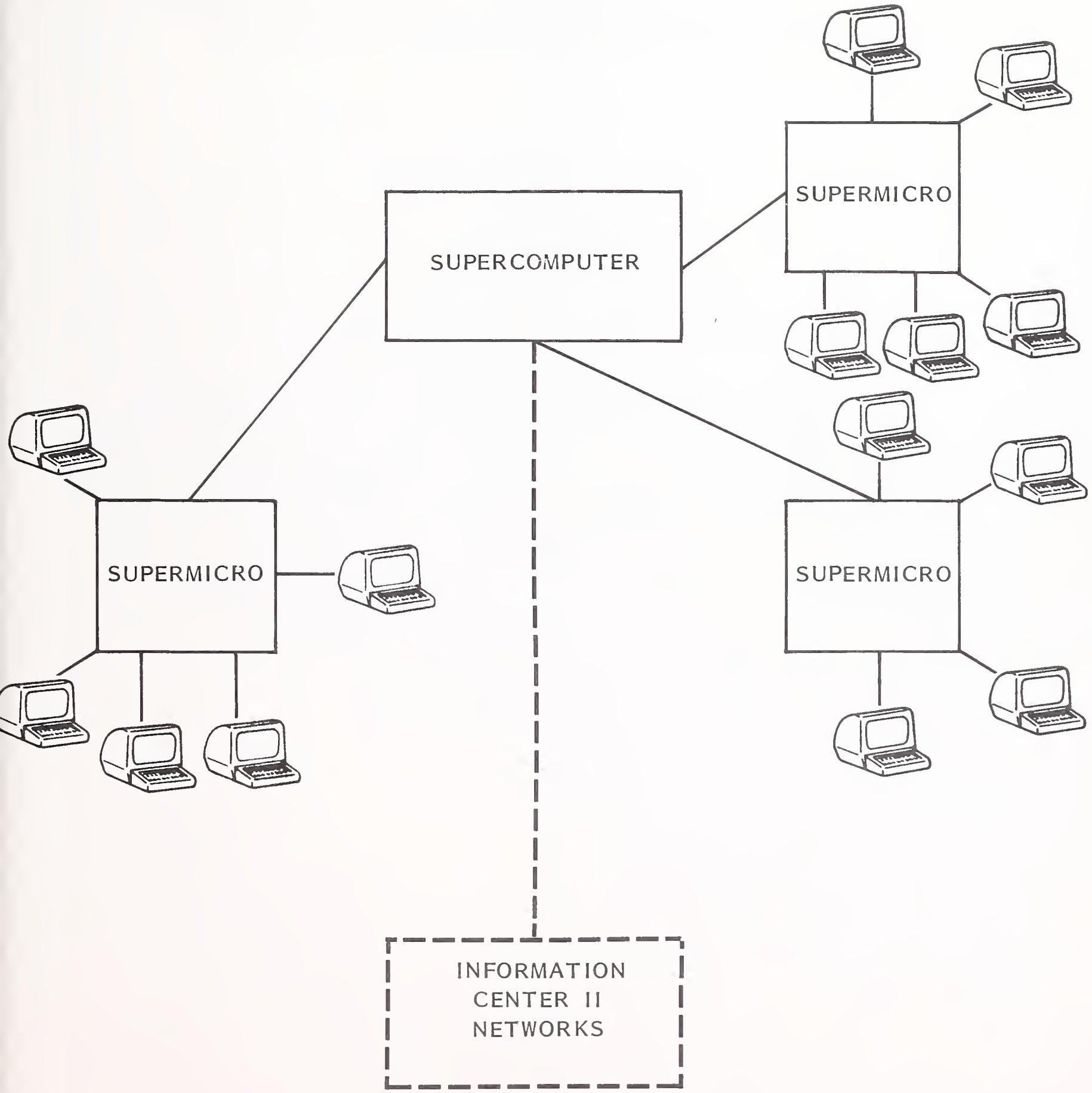

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EXHIBIT V-11

THE VICIOUS CIRCLE OF TRADITIONAL SOFTWARE DEVELOPMENT

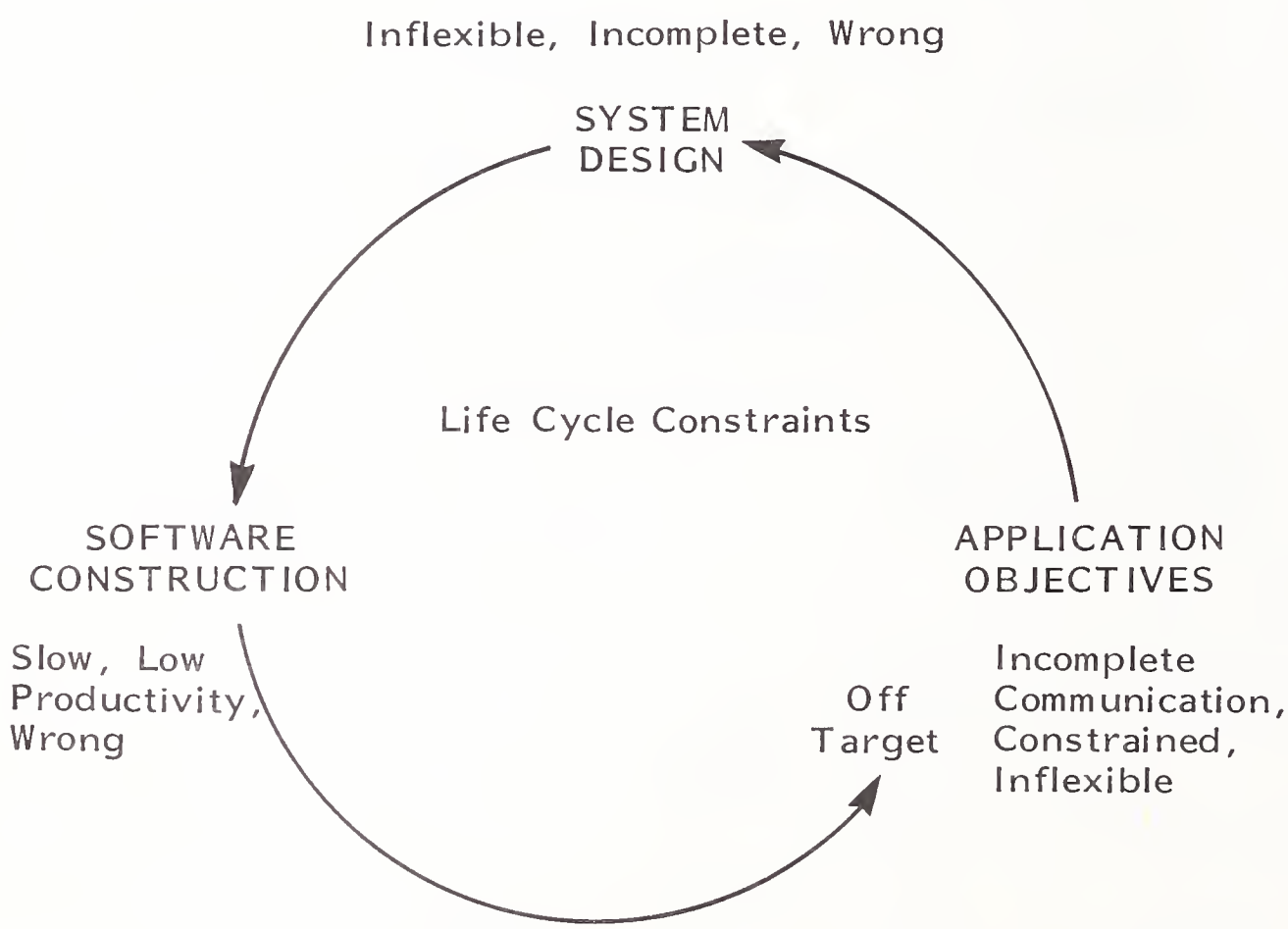

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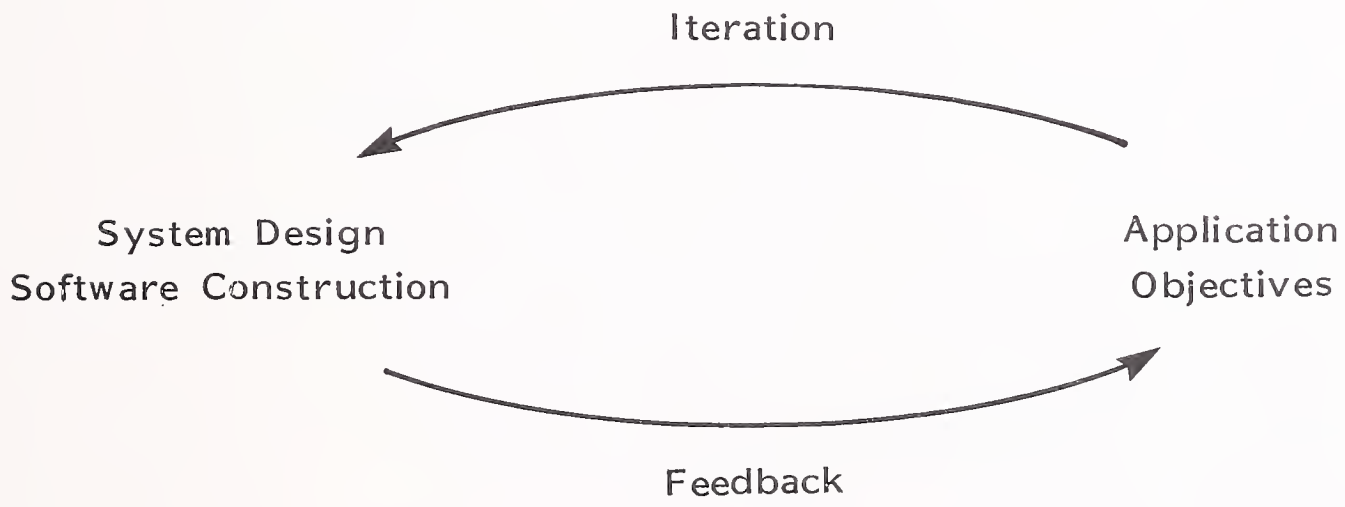
EXHIBIT V-12

THE VIRTUOUS LOOP OF THE INFORMATION CENTER



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APPENDIX A: QUESTIONNAIRE

Questionnaire:
Information Centers and Fourth Generation Languages

1. Information Center Data

A. How long has your company supplied Information Center services? _____ years

a. What was the reason for your company's starting?

_____

_____

b. What type of hardware and software are used?

1. Hardware:

_____

2. Operating System and Communications environment:

_____

3. Software packages made available to users:

_____

_____

_____

B. About how many Information Center users are there now? How many do you expect in two years?

	Number of Users	
Type of User	1983	1985
Programming Staff	_____	_____
Senior Executives	_____	_____
Senior Executives' Staff	_____	_____
Other Managers	_____	_____
Other Managers' Staff	_____	_____
Clerical	_____	_____

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2. Please provide estimates on the proportion of your hardware resources that your organization devotes to Information Center activities (now and two years from now). What do you see as the reasons for a change?

	1983	1985	Reason for Change/Comments
• Total Processing capability (express in MIPS*)	_____	_____	
– Percent used for Information Center purposes	____%	____%	
• Total number of terminals	_____	_____	
– Number of conventional terminals used for Information Center purposes	_____	_____	
• Number shared with other IS functions	_____	_____	
• Number dedicated to Information Center purposes	_____	_____	
• Number of intelligent workstations tied to mainframes	_____	_____	

*Millions of instructions per second.

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3. The Information Center may sometimes be viewed as filling similar needs as standalone personal computers. Please indicate the advantages and disadvantages that you feel the Information Center has compared to standalone personal computers. Please give comments where you:

- See strong advantages or disadvantages.
- Believe your organization's experience may be different than experience generally.
- See changes occurring in the future.

Informations Center's Advantages & Disadvantages
Compared to Standalone Personal Computers (check one)

Area of Comparison	Don't Know	Information Center Has: Strong Advantages	Information Center Has: Advantages	Evenly Balanced	Information Center Has: Disadvantages	Information Center Has: Strong Disadvantages	Comments
Costs							
— Initial	___	___	___	___	___	___	
— Ongoing	___	___	___	___	___	___	
Ease of Use	___	___	___	___	___	___	
User Control	___	___	___	___	___	___	
Consistency in Response Time	___	___	___	___	___	___	
Software							
— Availability	___	___	___	___	___	___	
— Flexibility	___	___	___	___	___	___	
Support							
— Needed	___	___	___	___	___	___	
— Available	___	___	___	___	___	___	
Other (describe) _____ _____ _____	___	___	___	___	___	___	

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4. The Information Center may sometimes be viewed as filling similar needs as Commercial Timesharing. Please indicate the advantages and disadvantages that you feel the Information Center has compared to Commercial Timesharing. Please give comments where you:

   - See strong advantages or disadvantages.
   - Believe your organization's experience may be different than experience generally.
   - See changes occurring in the future.

Information Center's Advantages & Disadvantages Compared to Commercial Timesharing (check one)

Area of Comparison	Don't Know	Information Center Has: Strong Advantages	Information Center Has: Advantages	Evenly Balanced	Information Center Has: Disadvantages	Information Center Has: Strong Disadvantages	Comments
Costs							
– Initial	___	___	___	___	___	___	
– Ongoing	___	___	___	___	___	___	
Ease of Use	___	___	___	___	___	___	
User Control	___	___	___	___	___	___	
Consistency in Response Time	___	___	___	___	___	___	
Software							
– Availability	___	___	___	___	___	___	
– Flexibility	___	___	___	___	___	___	
Support							
– Needed	___	___	___	___	___	___	
– Available	___	___	___	___	___	___	
Other (describe) _____ _____ _____	___	___	___	___	___	___	

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5. Which Fourth Generation Languages do you use or plan to use in your company?

Languages	Year Use Began/ Will Begin	Number of People Using it Now		Number of People Expected to Be Using it in 1985	
		Programmers	Nonprogrammers	Programmers	Nonprogrammers

6. Fourth Generation Language Production and Prototype System

A. What has been your experience in having end users construct Fourth Generation Language based programs that are used for ongoing production or reporting (i.e., replacing conventional systems development)?

B. To what extent are Fourth Generation Languages used to construct prototype systems that are later used to design permanent conventional systems?

C. Do you have future plans to use Fourth Generation Languages as production or prototype systems? Please describe.

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7. What are the main departments that use the Information Center and Fourth Generation Languages in your company? What are the main uses? How much do you expect this to change in two years?

	1983	1985
Information Center Users and Uses		
Fourth Generation Language Users and Uses		

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8. What impact (positive or negative) have Information Centers and Fourth Generation Languages had (or what will they have) on your company? Please be as specific as possible.

Impact On	Information Center	Fourth Generation Language
EDP Programming Request Backlog		
User Satisfaction		
System Quality		
Programming Time		
Revenues		
Expenses		
Profits		
ROI		
Other		

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9. Staff Support

A. How much central staff support is provided now for Information Center and Fourth Generation Languages? In two years?

Central Staff Support	Number of People (in full-time equivalents) 1983	1985
Information Center Support	_____	_____
Fourth Generation Language Support	_____	_____

B. What kinds of backgrounds do/will staff have (e.g., systems programming, application software, MBA) ?

_____

_____

_____

_____

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General Questions

A. How many levels below the CEO is the top information systems executive? _____

a. Is this satisfactory? ☐ Yes ☐ No

b. Why? _____

B. How important is the organization's information systems capability to the CEO?
(DK = Don't Know, 1 = Low Importance, 5 = High Importance) _____

– Why? _____

_____

C. How many levels below the top information systems executive in the top data administrator? _____

– How will this change in the future? _____

_____

D. What is the experience or knowledge of the top data administrator in the following areas? What should it be in the future? (1 = Low, 5 = High)

Experience Area	Amount of Experience Now	Future
General Data Processing	_____	_____
Data Base Management Software	_____	_____
Specific Application(s)	_____	_____
User Department Operations	_____	_____
Other (specify) _____	_____	_____

_____

E. What is used to measure the performance of the information systems function (either generally or for particular parts)?

Measurement	Type of Process (check) Informal	Formal
Internal Rate of Return	☐	☐
Return on Investment	☐	☐
Cost/Benefit	☐	☐
Other (specify) _____	☐	☐

_____

F. Which formal design or programming methodologies do you use or plan to use?

_____

_____

_____

_____

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APPENDIX B: FUNCTIONAL CLASSIFICATION EXAMPLES

APPENDIX B: FUNCTIONAL CLASSIFICATION EXAMPLES (WITH SAMPLE CODING)

	CODE
ADMINISTRATIVE	
Computer support - in-house timesharing	1001
Computer support - other (describe)	1002
(note: for communications/networks see next heading)	
Office systems - word processing	1003
Office systems - other	1004
Records/lists - customers, shareholders, etc.	1005
Royalty/lease systems	1006
Other (describe)	1007
COMMUNICATIONS/NETWORKS	
Intrabuilding (local network) - data only	2501
Intrabuilding (local network) - voice and data	2502
Multilocation (same city) - data only	2503
Multilocation (same city) - voice and data	2504
National network - data only	2505
National network - voice and data	2506
Other (describe)	2507
FINANCIAL	
Accounts payable	1101

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Accounts receivable	1102
Auditing	1113
Billing	1103
Budgetary	1104
Cost accounting	1105
Financial planning	1106
Fund accounting	1107
General ledger	1108
Labor distribution	1109
Payroll	1110
Tax reporting	1111
Other (describe)	1112

OPERATIONS

Maintenance - equipment	1301
Maintenance - facilities	1302
Reservations	1303
Scheduling - labor	1304
Scheduling - vehicles	1305
Other (describe)	1306

PERSONNEL

Collective bargaining	1401
EEO	1402
Records	1403
Recruitment	1404
Skills inventory	1405
Benefits	1406
OSHA	1407
Other (describe)	1408

SALES

Order entry	1501

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Point of entry systems	1502
Purchase order writing	1503
Sales analysis	1504
Other (describe)	1505

STATISTICS

Government reporting	1601
Statistical analyses	1602
Other (describe)	1603

INVENTORY

Fixed assets	1201
Inventory	1202
Receiving	1203
Shipping (Also see specific industry categories)	1204

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APPENDIX C: FUNCTIONAL CLASSIFICATION EXAMPLES

APPENDIX C: FUNCTIONAL CLASSIFICATION EXAMPLES (WITH SAMPLE CODING)

	CODE
GOVERNMENT	
Judicial Administration	1801
Law enforcement - case tracking	1802
Legislative support	1803
Military - communciations	1804
Military - embedded weapons systems	1805
Military - other	1806
Permit issuance	1807
Rate determination	1808
Social programs - case tracking	1809
Social programs - eligibility and payments	1810
Statistics - commerce and industry	1811
Statistics - population and health	1812
Statistics - other	1813
Taxation - income tax	1814
Taxation - property tax	1815
Taxation - other	1816
Traffic tickets	1817
Voter registration	1818
Other (describe)	1819

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HEALTH CARE

Ambulatory care - financial/administrative	1901
Ambulatory care - patient care	1902
Hospital - patient accounting, insurance claims	1903
Hospital - other administrative	1904
Hospital - patient care	1905
Hospital - management information system	1906
Hospital - laboratory	1907
Hospital - minicomputer-based application	1908
Other (describe)	1909

EDUCATION

Computer-assisted instruction	2001
Course scheduling	2002
Financial aid	2003
Fund raising	2004
Grants	2005
Student records	1005
Student support (academic data processing)	2006
Other (describe)	2007

INSURANCE

Actuarial	2101
Agency support - insurance functions	2102
Agency support - administrative functions	2103
Branch office support	2104
Claims processing - health	2105
Claims processing - other	2106
Policy issuance - property/casualty - personal lines	2107
Policy issuance - other	2109
Policy management	2110
Product design	2115
Rating - property/casualty - personal lines	2111

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Rating - property/casualty - commercial	2112
Statistical reporting	2113
Other (describe)	2114

MANUFACTURING

Bill of material	2201
Capacity planning	2202
Computer-assisted manufacturing (CAM)	2203
Engineering Change	2204
Manufacturing Resources Planning (MRP II)	2205
Master scheduling	2206
Numerical control	2208
Plant layout	2207
Process control	2208
Resource planning	2209
Shop floor control	2210
Other (describe)	2211

SCIENTIFIC/ENGINEERING

Computer-assisted Design (CAD) - electronic	2301
Computer-assisted Design (CAD) - mechanical	2302
Computer-assisted Design (CAD) - civil	2303
Computer-assisted Design (CAD) - other	2304
Energy management	2305
Environmental monitoring	2306
Materials/properties data base	2307
Other (describe)	2308

TRANSPORTATION/UTILITIES

Customer accounting	1704
Network management and control	2401
Route optimization	2402
Status reporting - bill of lading	2403

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Status reporting - equipment	2404
Tariffs	2405
Transportation terminal system	2406
Other (describe)	2407

BANKING AND FINANCE

Arbitrage	1701
Cash management	1702
Credit/debit cards	1703
Customer information systems	1704
Demand deposit administration	1705
Foreign exchange	1706
Letter of credit	1707
Loans	1708
Mortgage administration	1709
Portfolio analyses and reporting	1710
Profitability analyses	1711
Stockholder accounting	1712
Teller equipment (ATM's)	1713
Trust	1714
Other (describe)	1715

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